PALEONTOLOGY

Volume 24 NOVEMBER, 1950 Number 6

JOURNAL OF PALEONTOLOGY

A publication of The Society of Economic Paleontologists and Mineralogists *and* The Paleontological Society *with the generous support and cooperation of* The American Association of Petroleum Geologists *and* The Geological Society of America

UNIVERSITY OF MICH. 1
JAN 2 1951
MUSEUMS LIBRARY

CONTENTS

Corals from the Putjangan beds (lower Pleistocene) of Java ..... *J. H. F. Umbgrove* 637

Ostracoda from Middle Devonian Bone beds in central Ohio ..... *Grace Ann Stewart* 652

Conodonts from the Cedar Valley limestone of Iowa ..... *H. R. Downs* and *Walter Youngquist* 667

A unique Mississippian nautiloid from Kentucky ..... *A. K. Miller* and *Charles Collinson* 673

A new foraminiferal fauna from the Esna shales and Upper Cretaceous Chalk of Egypt ..... *S. E. Nakkady* 675

A parallel grinding instrument for the investigation of fossils by serial sections ..... *W. N. Croft* 693

Bibliography and index to new genera, species and varieties of Foraminifera for the year 1949 ..... *Hans E. Thalmann* 699

Paleontologic classification ..... *Claud William Wright* 746

NOMENCLATURAL NOTE

Notes on nomenclature, July, 1950 ..... *G. Winston Sinclair* 749

INDEX 755

EDITORS

A. Scott Warthin, for The Paleontological Society.

J. Marvin Weller, for The Society of Economic Paleontologists and Mineralogists.

The Journal of Paleontology is published bi-monthly. The numbers issued in January, May, and September are sponsored by The Paleontological Society in cooperation with The Geological Society of America; those issued in March, July, and November are sponsored by The Society of Economic Paleontologists and Mineralogists in cooperation with The American Association of Petroleum Geologists.

The subscription price of the Journal of Paleontology is $10.00 per year prepaid to addresses in the United States.

Single numbers, $2.00 each to nonmembers, $1.50 to members.

Postage is charged extra for all other countries in the Postal Union, 40 cents on annual subscriptions (total $10.40).

The Journal will furnish reprints at cost. Orders should accompany manuscript.

Communications about the Journal, subscriptions, rates, memberships, change of address, and nonreceipt of preceding numbers should be addressed to Society of Economic Paleontologists and Mineralogists, P. O. Box 979, Tulsa 1, Oklahoma. Claims for nonreceipt of preceding numbers must be sent in within three months of the date of publication in order to be filled gratis. Communications in regard to advertising should be addressed to J. Marvin Weller, Walker Museum, University of Chicago, Chicago 37, Ill.

Communications in regard to manuscripts or purely editorial matters should be addressed to J. Marvin Weller, Walker Museum, University of Chicago, Chicago 37, Ill. or to A. Scott Warthin, Vassar College, Poughkeepsie, N.Y.

Contributors are requested to instruct their photographers to illuminate fossils from the upper left side, the conventional manner. Plates normally should be arranged for publication at the size of 5½ by 7½ inches, exclusive of margins, heading, and title. Printed numerals of standard size and form may be obtained free from either editor. When requesting them state number of plates and the dimensions of each plate.

Entered as second-class matter at the Post Office at Tulsa 1, Oklahoma, under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in paragraph 4, section 538, P. L. and R., authorized April 3, 1935.

Additional entry as second-class matter at the Post Office at Menasha, Wis.

GEORGE BANTA PUBLISHING COMPANY, MENASHA, WIS.

JOURNAL OF PALEONTOLOGY

A publication of THE SOCIETY OF ECONOMIC PALEONTOLOGISTS AND MINERALOGISTS *and* THE PALEONTOLOGICAL SOCIETY *with the generous support and cooperation of* THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS *and* THE GEOLOGICAL SOCIETY OF AMERICA

VOLUME 24 NOVEMBER, 1950 NUMBER 6

CORALS FROM THE PUTJANGAN BEDS (LOWER PLEISTOCENE) OF JAVA

J. H. F. UMBGROVE

Instituut voor Mijnbouwkunde, Delft, Holland

ABSTRACT—Forty species of corals from the lower Pleistocene of Java have been identified, only 50 per cent of them living species, at least 25 per cent below what might be expected for such a collection. This abnormally low percentage is probably due to the special character of the fauna which consists mainly of solitary "deep water" corals. A systematic discussion is given of 24 species. Ten new species are described.

INTRODUCTION

CORALS collected before World War II by members of the Geological Survey of Java in the Kendeng Mountains between Trinil and Surabaja belong to three succeeding stratigraphic zones, (1) upper Kalibeng beds, (2) Putjangan beds, and (3) Kabuh beds. The fauna of the mid-Pleistocene Kabuh beds cannot be considered because I have received only two species from these beds, *Coeloria daedalea* (Dana), location 22, and *Goniopora stokesi* E. & H., location 182, both still living species. The corals from the upper Pliocene so-called upper Kalibeng beds were described in a previous paper (Umbgrove, 1946). The present paper gives the results of my examination of the corals from the Putjangan beds.

A second collection of corals was sent to me by Dr. J. Cosijn, then director of the Watudakon Jodium Company. His collection is from the vicinity of Modjokerto. The collection of the Geological Survey was made partly in the same region, partly farther west. A correlation between these localities is given in the explanation accompanying sheet 110 (Modjokerto) of the geological map of Java 1:100,000 by J. Duyfjes (1938), and C. O. van Regteren Altena, who is studying the molluscs of the Kendeng region, published a complete list of localities for both collections (Altena, 1938).

AGE OF THE PUTJANGAN BEDS

Some smaller Foraminifera from the same region were described by Boomgaart and Vroman in 1936. Other specialists have studied crustaceans and echinids from the same complex of strata (Van Straelen, 1938; Jeannet and Martin, 1937) and a synopsis of the stratigraphic relations was given by Duyfjes in 1936. Von Koenigswald (1935), who studied the land vertebrates, concluded that the Putjangan beds are probably lower Pleistocene. He recognized, however, that they might be uppermost Pliocene because Martin (1932) in his preliminary examination of the molluscs found 68 per cent of 128 species to be still living and considered this

to be a lower number than might be expected in the Pleistocene.

I cannot agree with Martin's opinion, because this figure is 15 per cent greater than that for the upper Pliocene Sonde fauna—53 per cent (Martin, 1928)—which occurs immediately below the Putjangan beds. Also the only two Pleistocene figures presented by Martin (1921) are for (1) the subsurface at Batavia, 86 per cent of 22 species, and (2) the vicinity of Grissee, 90 per cent of 30 species. In both cases he was dealing with small numbers of species and in both he remarked upon the fresh condition of the specimens. These specimens may be Pleistocene but they might be Recent and there is no reason to consider them lower Pleistocene as Martin did. In my opinion, nothing opposes our accepting Martin's figure of 68 per cent as normal for a lower Pleistocene suite of marine molluscs if the figure be obtained by exactly the same methods as Martin's and if the personal equation, the species concept, etc., be identical with his.

In a later paper von Koenigswald (1935) presented new evidence in favor of his opinion. He reported remains of land mammals which have a wide distribution in the lower Pleistocene of China and India and pointed out that mammals characterizing the upper Pliocene of eastern Asia are conspicuously lacking in the so-called Djetis fauna of the Putjangan beds and in other strata in Java of apparently equal age.

Therefore, I believe that there are good reasons for considering the Putjangan beds lower Pleistocene in age.

SPECIAL CHARACTER OF THE CORAL FAUNA

The accompanying list of 43 Putjangan corals includes 40 identified species, half of which are still living. This remarkable figure of 50 per cent is at least 25 per cent below that which might be expected for an adequate collection of lower Pleistocene reef corals, as 69 to 70 per cent of living species is the well established figure for corals from the upper Pliocene Sonde and Kalibeng beds. Consequently, a figure of at least 75 per cent might be expected for the lower Pleistocene Putjangan beds. An explanation of this discrepancy may lie in the facies of this remarkable coral faunule. It is not a true reef fauna, but a biocoenosis which could withstand severe conditions of rapid sedimentation inimical to reef corals in general and unfavorable to the formation of a reef. There is no possibility of a patch reef, as in the lower Pliocene corals of Prupuk, or of lenses of reef limestone, as in the upper Pliocene of Sonde, because the collection comes from thin marine intercalations in a complex of volcanic breccias. The special character of the coral fauna is well established by the abundance of solitary and "deep water" corals belonging to the groups Turbinolidae, Eupsammidae (*Balanophyllia, Dendrophyllia, Heteropsammia, Endopachys*), Oculinidae (*Cyathohelia*) and Astrangidae, which are represented by hundreds of specimens. In strong contrast to these, other species are represented by one or a few specimens only. It is well known that turbinolid, eupsammid, oculinid and astrangid corals thrive either at greater depths than, or in shallow seas under conditions very unfavorable to, most of the corals that build modern reefs. Evidently the corals of the Putjangan beds lived in an environment which acted in a selective manner and I suggest that the principal controlling factor was probably lack of sunlight. The much disturbed, shallow and muddy waters produced a biotope which, in respect to dimness of light, was comparable to conditions in deeper water. A few true reef corals, which apparently could endure this special biotope, also settled down here. Among them are a few well known shallow water species, which must be considered as more eurytope. Presumably a greater number of the corals which normally live on the deeper margins of a reef found conditions here analogous to their usual habitat. Knowledge of living corals is based principally on collections from the upper parts of reefs and only a very few examinations have been made of the deeper parts of reefs by use of a diving helmet. Knowledge of the deep-sea corals is largely based on a limited number of deep-sea dredging expeditions. Consequently, because reef corals are better known, if a suite of fossil corals from a Miocene or more recent reef be compared to the living fauna, the percentage of living species will be larger than in a suite of deep-sea forms. In my opinion there is not the slightest doubt that this explains the low

TABLE 1.—LIST OF SPECIES AND LOCALITIES

Systematic list of species	Localities Dr. J. Cosijn	Localities—Geological Survey*	Recent
1. *Flabellum pavoninum* var. *distinctum* E. & H.	60, 74		+
2. *Flabellum stokesii* E. & H.	1, 37, 39, 40, 45, 54, 71, 74, 75, 82, 89		+
3. *Flabellum rubrum* (Quoy & Gaim.)	1, 46, 52, 54, 55, 59, 60, 78, 82, 97		+
4. *Acanthocyathus grayi* E. & H.	37, 60, 62, 71, 78, 89	24, 98, 251, 253, 257	+
5. *Acanthocyathus spinosa* Umbgrove, n. sp.	52, 78	101, 251	
6. *Heterocyathus aequicostatus* E. & H.	2, 27, 37, 39, 46, 52, 57, 64, 74, 84, 89, 103, 106, 107, 110, 132, 137	16, 63, 89, 106, 113, 175, 177, 178, 185, 252, 257, 260	+
7. *Paracyathus stokesii* E. & H.	62	176	+
8. *Paracyathus nannodes* Felix	58		
9. *Paracyathus javana* Umbgrove, n. sp.	77		
10. *Paracyathus* sp.	47, 78		
11. *Seriatopora micrommata* var. *javana* Umbgrove	31	9, 252, 258	
12. *Seriatopora delicatula* Felix	30	126	
13. *Pocillopora jenkinsi* Reuss	6, 33	252, 258	
14. *Stylophora pocilloporoides* Umbgrove, n. sp.	33	9, 216	
15. *Stylophora granulata* Umbgrove, n. sp.	77		
16. *Cyathohelia axillaris* Ell. & Sol.	71, 77, 78, 92		+
17. *Coenangia polygonalis* Umbgrove, n. sp.	45, 62, 75		
18. *Antillophyllia constricta* (Brüggem)	37, 49	128, 176, 219, 252, 260	+
19. *Progyrosmilia regularis* Umbgrove, n. sp.	37		
20. *Gyrosmilia diadema* Umbgrove, n. sp.	54		
21. *Cyphastraea seraila* Forsk.	50	260	+
22. *Leptastraea purpurea* Dana		9, 253	+
23. *Favia speciosa* Dana	37, 49, 50, 54	253	+
24. *Lobophyllia corymbosa* (Forsk.)		9	+
25. *Acanthastraea* cf. *hemprichii* (Ehr.)	32		+
26. *Oulastrea praecrispata* Umbgrove, n. sp.	37		
27. *Fungia fungites* (Lin.)		9	+
28. *Fungia inaequicostata* Gerth		6, 9	
29. *Fungia concinna* Verrill		6, 9	+
30. *Fungia actinodiscus* Umbgrove, n. sp.		126	
31. *Pavona clavus* Dana	33, 37		+
32. *Leptoseris* sp.	75		
33. *Cyathoseris lophiophora* Felix		9, 252, 260	
34. *Pachyseris compacta* Umbgrove, n. sp.	37, 49		
35. *Balanophyllia oppenheimi* Felix	1, 42, 45, 46, 47, 52, 55, 60, 62, 78, 81, 92, 96, 97, 99	87, 98, 101, 157	
36. *Balanophyllia complanata* Gerth	45, 46, 52		
37. *Dendrophyllia digitalis* Felix	38, 45, 46, 47, 62, 77, 78, 81, 85, 92, 97, 99, 103		
38. *Heteropsammia cochlea* (Spengler)	27, 35, 38, 52, 57	185, 228, 232	+
39. *Endopachys grayi* E. & H.	46, 52, 60, 99	113	+
40. *Goniopora stokesii* E. & H.	30, 33, 37	182	+
41. *Dictyaraea anomala* Reuss		64, 260	
42. *Porites* sp.			
43. *Alveopora daedalea* Forsk.	49		+

* This column also includes localities in the upper Kalibeng beds (Umbgrove, 1946, p. 88).

percentage of living species in the Putjangan beds. One must always allow for the possibility that coral species described as new may later be found in the living fauna and this possibility appears to be much greater in the case of the special facies of the Putjangan beds than in the case of a true reef-building fauna of equal age.

Never before have I had to establish so many new species as in this study of the corals from the Putjangan beds. As studies continue some of the new species undoubtedly will be recognized in living faunas from deeper parts of the sea and the percentage of living species in the Putjangan will rise.

Similar relations between living and extinct species need not be expected in other groups of marine animals. In this respect attention should be directed to the marine molluscs. As mentioned above, Martin's percentage figure for the Mollusca is not abnormal. Coral faunas of a facies type more or less comparable to that of the Putjangan beds were described from an elevated Pleistocene or Holocene marl at Talaud (Umbgrove, 1938) and from the upper Miocene Menkrawit, Antjam and Domaring beds of Borneo (Umbgrove, 1929). A large suite of molluscs from the Menkrawit beds was described by Beets (1941) and the percentage of living species found by Beets is not abnormal. (The collections of corals are too small to establish a significant percentage figure.)

These and other similar percentage figures are, of course, only of value if critically applied.

The personal equation, statistical, technical, geographic and other factors are of importance and figures based on corals may differ widely from those based on molluscs from the same locality. This matter has been treated in another paper (Umbgrove, 1946a).

Table 1 is a list of the fauna and localities. The crosses in the right hand column indicate the presence of the species in the living fauna of the present reefs. Not all of the species are discussed in the systematic section which follows. Those not included are either described in recent papers by the author on other Javanese faunas (upper Miocene of Tjisande, lower Pliocene of Prupuk, upper Pliocene Kalibeng beds) or they are well known species which need no further comment. The collection is now in the Institute of Mines at Delft.

SYSTEMATIC DISCUSSION

FLABELLUM STOKESII Edwards & Haime

Plate 81, figures 3, 4

Flabellum owenii EDWARDS and HAIME, 1849, Annales sci. nat., vol. 3, p. 279, pl. 8, fig. 9; —— and ——, 1857, Hist. Nat. Corall., vol. 2, p. 96.

Flabellum aculeatum EDWARDS and HAIME, 1849, Annales sci. nat., vol. 3, p. 272, pl. 8, fig. 3; —— and ——, 1857, Hist. Nat. Corall., vol. 2, p. 87.

Flabellum debile EDWARDS and HAIME, 1849, Annales sci. nat., vol. 3, p. 270, pl. 8, fig. 2; —— and ——, 1857, Hist. Nat. Corall., vol. 2, p. 88.

Flabellum stokesii EDWARDS and HAIME, 1849, Annales sci. nat., vol. 3, p. 278, pl. 8; —— and ——, 1857, Hist. Nat. Corall., vol. 2, p. 96; GARDINER, 1902, Marine investigations in South Africa, vol. 2, p. 131, note; GERTH, 1922, Geol. Reichs-Mus. Leiden Samml., n. f., pt. 2, p. 402, pl. 57, fig. 14; FAUSTINO, 1927, Bur. of Science, Manila, Mon. 22, p. 54, pl. 3, figs. 10–21.

Flabellum variable SEMPER, 1872, Zeitschr. Wiss. Zoöl., vol. 22, pp. 245–251, pls. 17, 18, figs. 1–10; GERTH, 1922, Geol. Reichs-Mus. Leiden Samml., n. f., pt. 2, p. 401, pl. 57, fig. 16; UMBGROVE, 1924, Geol. results of exploration in Ceram, p. 6; ——, Wetens. Meded., no. 4, p. 31.

Flabellum rubrum stokesii YABE and EGUCHI, 1942, Tohoku Imp. Univ. Sci. Repts., 2nd ser., vol. 22, p. 98, pl. 8.

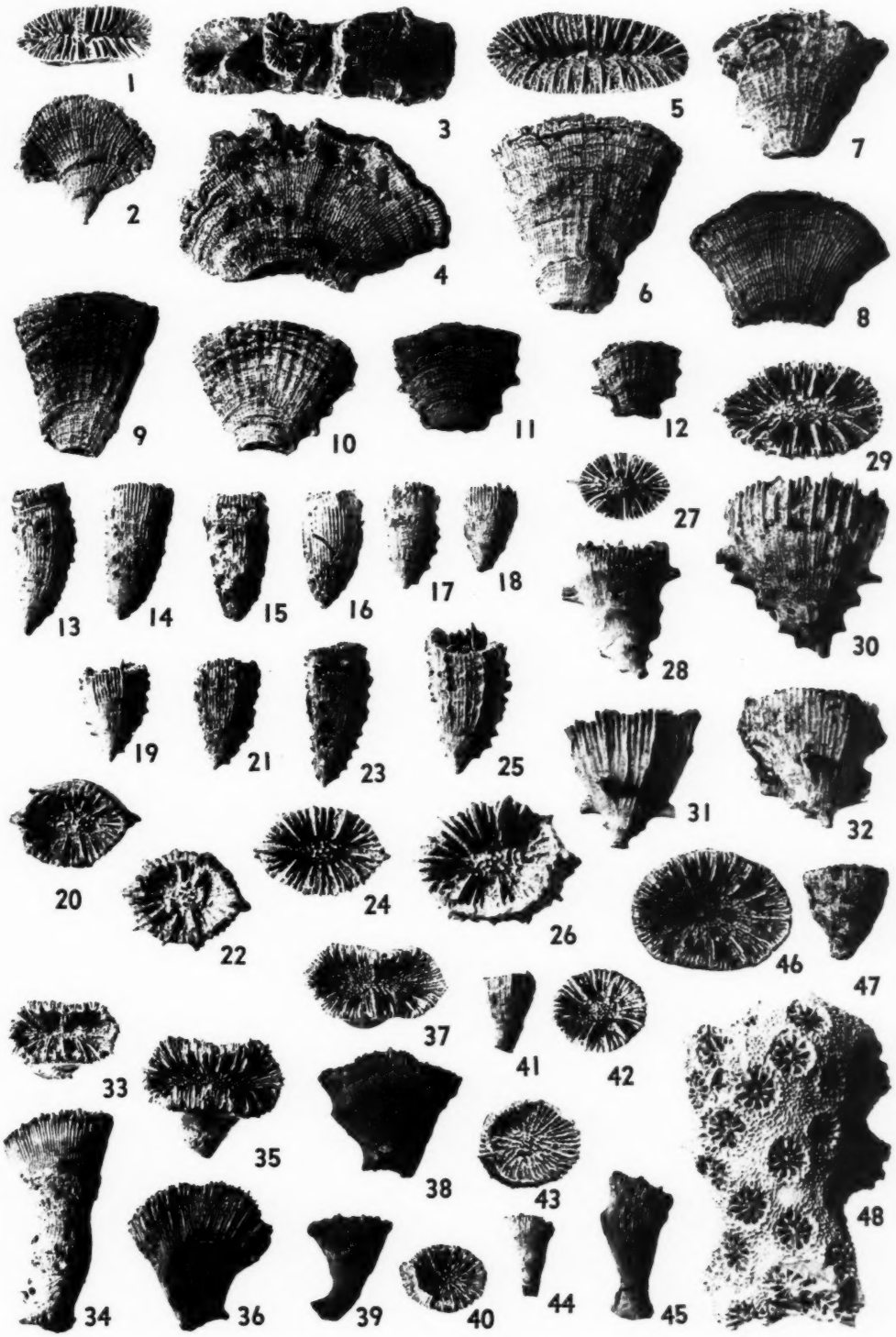
Moseley and Gardiner pointed out that *Flabellum variabile* Semper belongs in the

---

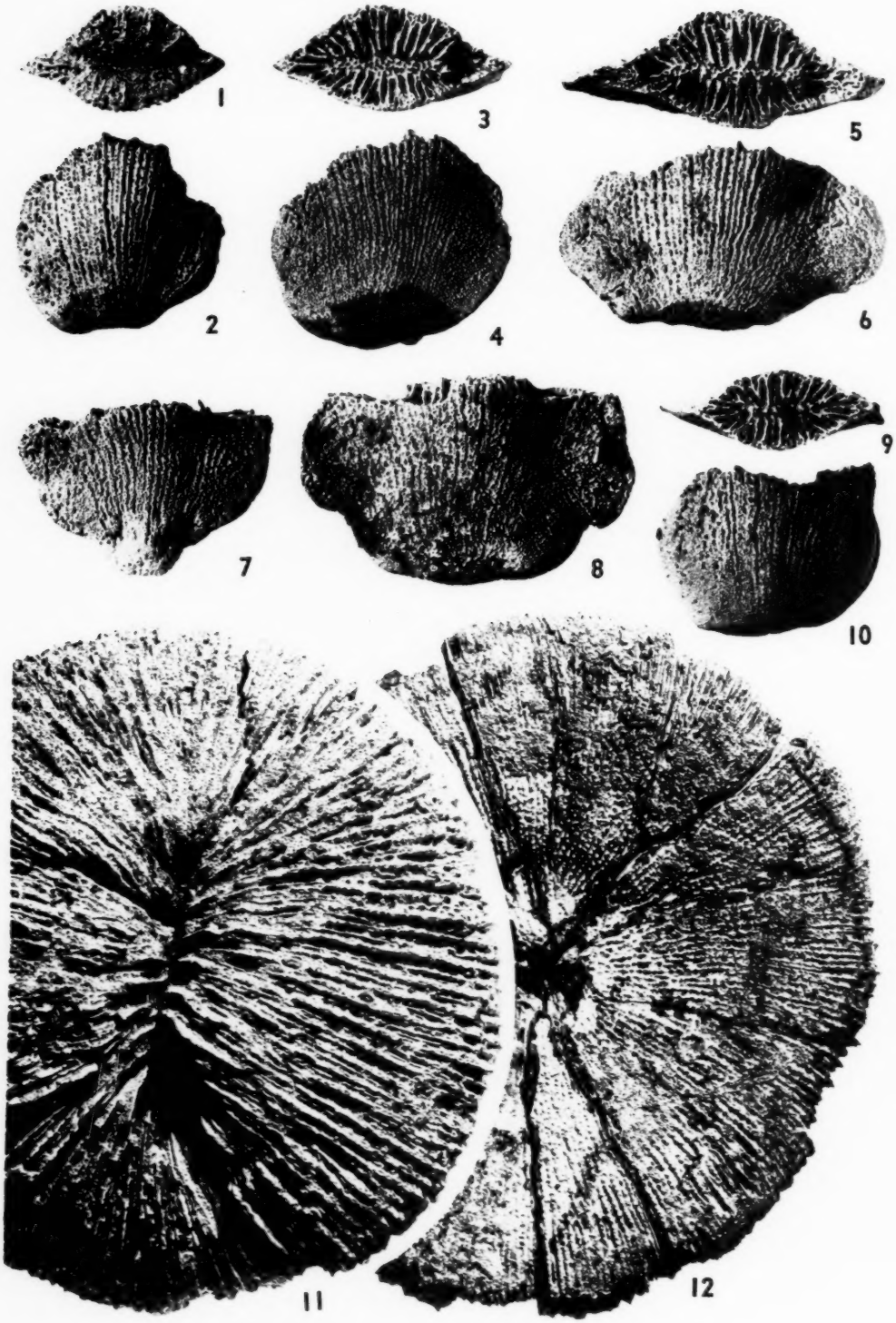
EXPLANATION OF PLATE 81

All figures natural size except *20–26* and *42, 43, 46, 48*.

FIGS. *1, 2—Flabellum pavonium* var. *distinctum* Edwards & Haime. Locality 74.
3, 4—Flabellum stokesii Edwards & Haime. Abnormal growth; locality 37. (p. 640)
5–12—Flabellum rubrum (Quoy & Gaimard). Locality 60. (p. 641)
13–26—Acanthocyathus spinosa Umbgrove, n. sp. *20–26*, ×2. *13–18*, Locality 52; *19–24*, locality 101; *25, 26*, locality 251. (p. 642)
27–32—Acanthocyathus grayi Edwards & Haime. *27, 28*, Locality 257; *29, 30*, locality 78; *31*, locality 251; *32*, locality 71. (p. 641)
33–40—Paracyathus stokesii Edwards & Haime. *33, 34*, Locality 176; *35–40*, locality 62. (p. 643)
41–45—Paracyathus javana Umbgrove, n. sp. *42, 43*, ×2. Locality 77. (p. 643)
46, 47—Paracyathus sp. *46*, ×2. Locality 78. (p. 644)
48—Stylophora granulata Umbgrove, n. sp. ×3; locality 77. (p. 644)



Umbgrove, Lower Pleistocene corals



Umbgrove, Lower Pleistocene corals

synonymy of one of the species described by Edwards and Haime. Faustino selected *F. stokesii* E. & H. as the name of the species which he considered to be allied to *F. rubrum* (Quoy & Gaimard).

A few specimens show a spine at the lower ends of the sharp lateral edges. The longer axis of many specimens has a diameter of 5 cm. and a basal scar of 2.5 cm. The figured specimen is abnormal, the distal part being divided into three separate calices. A balanid has attached itself along the margin of the small central calice.

According to data recorded by Semper, Faustino, and Edwards and Haime the angle formed by the lateral edges varies from 40° to 85°. Among the fossil specimens from the Putjangan beds the angle may be still larger, as is shown in text-figure 1.

Distribution (according to synonyms given above).—Pliocene: Taiwan, Java and Sumatra; boring of Ngembak (Java) of unknown age; Pleistocene: Ceram; Recent: Indo-Pacific.

FLABELLUM RUBRUM Quoy & Gaimard
Plate 81, figures 5–12

Turbinolia rubra QUOY and GAIMARD, 1833, Voyage de l'Astrolabe, p. 188, pl. 14.
Flabellum rubrum GARDINER, 1902, Marine investigations in South Africa, vol. 2, p. 125, pl. 4; UMBGROVE, 1938, Zoöl. Meded., vol. 2, p. 264 (with synonymy); YABE and EGUCHI, 1942, Tohoku Imp. Univ. Sci. Repts., 2nd ser., vol. 22, p. 96, pl. 8, p. 131, pl. 11.
Flabellum variable, forma alta GERTH, 1922, Geol. Reichs-Mus. Leiden Samml., n. f., vol. 1, pt. 2, p. 401, taf. 57, fig. 16.
Flabellum variable UMBGROVE, 1926, Wetensch. Meded., no. 4, p. 31.

The internal structure of the corals from Garang, Java, described by Gerth under the name *"forma alta"* is quite similar to that of *F. variabile*, which belongs in the synonymy of *F. stokesii* E. & H., a species allied to *F. rubrum*. However *"forma alta"* has a more elongate shape and this is the most characteristic feature of *F. rubrum*. Variation of the angle formed by the lateral edges of 144 specimens from the Putjangan beds is shown in text-figure 1.

The variation curve reaches a maximum at about 30°. In *F. stokesii* the angle formed by the lateral edges is generally much larger, mostly more than 70° and consequently it must be regarded as a separate but closely

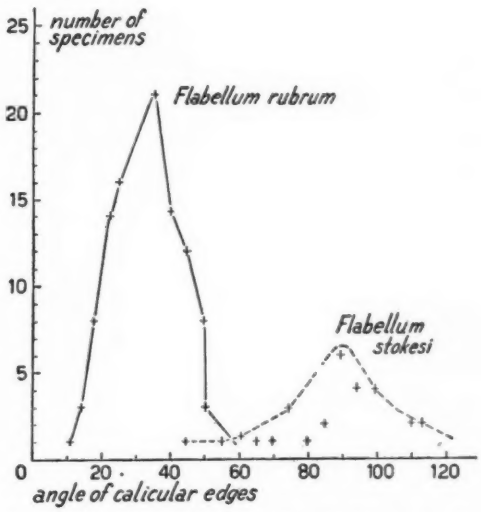


FIG. 1—Frequency curves of calicular angles in *Flabellum rubrum* and *Flabellum stokesii*.

allied species, as already mentioned by Faustino. Single specimens may be difficult to classify, but usually it is possible because the basal scar of *F. stokesii* is comparatively larger than that of *F. rubrum*.

Distribution.—Pliocene: Taiwan, Japan (Yabe and Eguchi), Java (Felix and Gerth) and Sumatra (Atjeh); Pleistocene or Holocene: Talaud; Recent: Indo-Pacific.

ACANTHOCYATHUS GRAYI
Edwards & Haime
Plate 81, figures 27–32

Acanthocyathus grayi EDWARDS and HAIME, 1848, Annales sci. nat., ser. 3, Zoöl., vol. 9, p. 293, pl. 9, figs. 2, 2a; UMBGROVE, 1938, Zoöl. Meded., p. 264; YABE and EGUCHI, 1942, Tohoku Imp. Univ. Sci. Repts., 2nd ser., vol. 22, p. 121; UMBGROVE, 1946, K. Akad. Amsterdam Proc., vol. 49, p. 88.

EXPLANATION OF PLATE 82

FIGS. *1–10—Endopachys grayi* Edwards & Haime. ×3. *1, 2, 9, 10*, Locality 60; *3–8*, locality 113. (p. 648)

11, 12—Fungia actinodiscus Umbgrove, n. sp. Natural size. Locality 126. (p. 647)

Trochocyathus laterocristatus FELIX, 1920, Palaeont. v. Timor, vol. 8, p. 16, pl. 128, fig. 10; GERTH, 1921, Geol. Reichs-Mus. Leiden Samml., n.f., vol. 1, p. 395.

Acanthocyathus malayicus GERTH, 1923, Geol. Reichs-Mus. Leiden Samml., vol. 9, p. 57, taf. 1, figs. 20, 21; UMBGROVE, 1924, Geological results of explorations in Ceram, p. 4.

Some of the specimens from Talaud, from the upper Kalibeng and Putjangan beds of Java, are excellently preserved but others are more or less worn. The former make possible a safe identification with the original description of Milne Edwards and Haime. The latter show that Felix's type of *Trochocyathus laterocristatus*, which is in the Institute of Mines at Delft, is nothing else than a damaged specimen of *Acanthocyathus grayi*. I have identified a good specimen from Padas Malang, near Trinil. Finally, comparison with Gerth's types of *A. malayicus* from Ngembak and Ngampel (Java) in the Leiden Museum show that these belong to the present species.

The number of lateral spines is variable. One specimen bears four spines at one side, three on the other. Altogether the following combinations have been observed: 3+3, 3+2, 2+2, 2+1, 4+3, 5+3, 4+4 and 5+2. The spines may be long and tapered or short with broad bases. One specimen from the Putjangan beds, locality 71, moreover, shows a spine in the center of the lateral wall and another specimen (loc. 251) bears a spine on each side (pl. 81, fig. 31). Well preserved calices have 65 to 70 septa. Fourteen septa, exceptionally 15 (and 16 in the specimen figured by Edwards and Haime), are more strongly developed than the others, and in front of these no pali occur. Mostly, the conical base is curved in the direction of the longer axis, but in some specimens it is curved in a direction perpendicular to it.

Gerth stated that *A. malayicus* from Borneo is closely allied to *A. grayi* and that it differs only by its smaller dimensions. The specimens now available differ widely in size and some agree exactly with Gerth's.

Distribution.—Neogene of Borneo and Java; Plio-Pleistocene of Japan, Ceram and Timor; Pleistocene or Holocene of Talaud; Pliocene of Java and Putjangan beds (lower Pleistocene) of Java; Recent, Indo-Pacific.

ACANTHOCYATHUS SPINOSA
Umbgrove, n. sp.
Plate 81, figures 13–26

Acanthocyathus spinosa UMBGROVE, 1946, (nom. nud.), K. Akad. Amsterdam Proc., vol. 49, p. 88.

Corallum strongly conical, compressed, slightly bent in the direction of the major axis, and sometimes also in the direction of the minor axis. Costae projecting, equally wide, beset with fine granules, some with coarse spines. Spines always present on costae corresponding to primary septa situated on opposite sides of the major axis. A third row of spines occurs on costae corresponding to primary septum nearest to one of the former. Occasionally spines are present on costae corresponding to the other primary septa. Some spines acute, but mostly broad-based and blunt. Calice elliptical. Table 2 summarizes the dimensions of corallum and calices in milimeters.

TABLE 2

Height of corallum	Major axis of calice	Minor axis of calice
10	8	6
13	9	6
15	10	7
15	8	4
17	10	7
20	8	6
20	10	6
21	8	6
23	12	8
24	8	6

The columella consists of a twisted mass of rods. Septa unequal; ten strongly rounded, projecting much beyond the edge of the wall and bearing numerous granules on their plain surfaces. Between these principal septa occurs a cycle of much less projecting and thinner septa ending in a crown of pali. These septa are separated by a third series of still shorter septa. A total of about 40 septa occur in a well developed corallum.

The description is based on 14 syntypes: ten specimens from locality 52, one from locality 78, one from locality 251, and two from locality 101.

Distribution.—Upper Kalibeng beds (loc. 251) and Putjangan beds (other localities).

HETEROCYATHUS AEQUICOSTATUS
Edwards & Haime

Heterocyathus aequicostatus EDWARDS and HAIME, 1857, Hist. Nat. Cor., vol. 2, p. 51; GARDINER, 1904, Marine investigations in South Africa, vol. 3, p. 105; UMBGROVE, 1938, Zoöl. Meded., vol. 20, p. 265; YABE and EGUCHI, 1942, Tohoku Imp. Univ. Sci. Repts., 2nd ser., vol. 22, p. 127, pl. 11; UMBGROVE, 1946, K. Akad. Amsterdam Proc., vol. 49, p. 88.

Heterocyathus phillipinensis SEMPER, 1872, Zeitschr. Wiss. Zoöl., vol. 22, p. 234.

Heterocyathus parasiticus SEMPER, 1872, Zeitschr. Wiss. Zoöl., vol. 22, p. 235; GERTH, 1922, Geol. Reichs-Mus. Leiden Samml., n.f., vol. 1, p. 396.

Heterocyathus oblongatus REHBERG, 1892, Abh. Ver. Hamburg., vol. 12, p. 9.

Heterocyathus elberti FELIX, 1913, Palaeontographica, vol. 60, p. 363; ——, 1915, Palaeontologie v. Timor, vol. 2, p. 38; ——, 1920, idem, vol. 8, p. 29; GERTH, 1922, Reichs-Mus. Leiden Samml., n.f., vol. 11, p. 395; UMBGROVE, 1926, Wetensch. Meded., no. 4, p. 30.

Heterocyathus sandalinus GERTH, 1922, Geol. Reichs-Mus. Leiden Samml., n.f., vol. 1, p. 397.

Heterocyathus rembangensis GERTH, 1922, Geol. Reichs-Mus. Leiden Samml., n.f., vol. 1, p. 397.

Heterocyathus rousseaui GERTH, 1922, Geol. Reichs-Mus. Leiden Samml., n.f., vol. 1, p. 398; UMBGROVE, 1926, Wetensch. Meded., no. 4, p. 30; ——, 1929, idem, no. 9, p. 58.

Heterocyathus cf. *rousseaui* GERTH, 1925, Leidsche Geol. Meded., vol. 1, p. 26.

The costae, septa and external granulation of this species are so variable that it is not surprising that many different names have been given to it. As might be expected, the variable number of openings of the sipunculid are not of specific value in these corals. Gardiner, who made a special study of this species, referred all the then known species of the genus to *H. aequicostatus* E. & H. (viz. *H. philippinensis*, *H. parasiticus*, *H. pulchellus* and *H. oblongatus*).

Gardiner's tables show that *H. elberti* also has to be placed among these synonyms because the number of septa (48), which induced Felix to consider it a separate species, frequently occurred in Gardiner's suites of *H. aequicostatus*. The same is true for *H. rembangensis* and *H. sandalinus*, the latter being distinguished by Gerth only on account of its "habitus." Gardiner's measurements and series of photographs also clearly show the great variability of the coral in this respect. The growth shape largely depends upon shape and dimensions of the gastropod or other object to which the coral attached itself, the presence or absence of a sipunculid, etc.

H. rousseaui was stated to be characterized by the presence of four cycles of septa and by alternately broad and thin costae separated by deep grooves. However, among the more than 900 specimens studied by Gardiner, these characteristics too were represented in different degrees of development as is shown convincingly by his tables and photographs.

I have studied a few hundred fossil specimens from Talaud, from the upper Kalibeng and Putjangan beds and I fully agree with Gardiner.

Distribution.—Miocene: Java; Neogene: Japan, Nias; Pliocene: Taiwan, Java and Atjeh; Plio-Pleistocene: Japan, Ceram and Obi; Pleistocene: Java and Borneo; Recent: Indo-Pacific.

PARACYATHUS STOKESII Edwards & Haime
Plate 81, figures 33–40

Paracyathus stokesii EDWARDS and HAIME, 1848, Annales sci. natur., ser. 3, vol. 9, p. 319, pl. 10, fig. 7; —— and ——, 1857, Hist. Corall., vol. 2, p. 53; VAN DER HORST, 1931, Indian Mus. Calcutta Rec., vol. 33, p. 7, pl. 1, figs. 1–6, pl. 2, fig. 3.

Three specimens from locality 62 and one from locality 176 undoubtedly belong to *P. stokesii*, a species which was described extensively by Van der Horst. One specimen from locality 62 is strongly compressed along the shorter axis, the calice thus having the shape of a figure eight (pl. 81, figs. 35, 36). Septa in five cycles, as in Recent specimens. (Van der Horst stated, "the fifth order of septa is nearly always complete," but his figure 3 of plate 2 shows that he meant the fifth cycle.) The specimen from locality 176 is undamaged. The calice is compressed but its base has a total height of 35 mm.; diameter of the calice 17 by 10 mm. According to Van der Horst *P. rotundatus* Semper belongs in the synonymy of the present species; the same is probably true for *P. coeruleus* Duncan.

PARACYATHUS JAVANA Umbgrove, n. sp.
Plate 81, figures 41–45

Paracyathus cf. *procumbens* GERTH, 1921, Geol. Reichs-Mus. Leiden Samml., n.f., p. 395 (Leidsche. Geol. Meded., vol. 5, p. 130), vol. 1.

Three specimens from locality 77 belong

to the same species as Gerth's *P.* cf. *procumbens*, which was restudied by me in the Geological Museum at Leiden. The present species, however, is different from *P. procumbens* because the six primary septa are much more strongly developed (broader and more exsert) than the others.

It differs from *P. nannodes* Felix by the same characteristic septal arrangement, and *P. nannodes* has much stronger pali.

One of the specimens has 48 septa; the others have four cycles complete and a few septa of the fifth cycle. Younger septa are fused in shape of a delta. Costae subequal; indistinct over part of the outer wall and covered by granulae. A flat scar of attachment shows that the base of polyp was broadened. Diameter of the slightly elliptical calice varies from 6 mm. by 7 mm. to 8 mm. by 10 mm. Height of the largest specimen, 20 mm.

Distribution.—Gerth's specimen is from a boring at Ngembak, Java; age uncertain.

PARACYATHUS sp.
Plate 81, figures 46, 47

One specimen from locality 47 and another from locality 78 differ from the last species. Identification is, however, impossible as the inner structure is damaged. Diameter of calice 9 mm. by 12 mm.; height of corallum, 15 mm. Septa in five complete cycles; 12 septa more strongly developed and exsert. Costae subequal and covered by minute and flattened granulae.

STYLOPHORA POCILLOPOROIDES Umbgrove, n. sp.
Plate 84, figures 7, 8

This species resembles *S. sokkohensis* Gerth in more than one respect, viz. (1) habitus and dimensions of the branches, (2) dimensions, (3) fine granulation of peritheca. It differs, however, by (1) absence of secondary septa, (2) absence of conspicuous granulae around calicular margin, (3) nonpolygonal but circular calices, (4) very compact coenenchyma, (5) constant occurrence of six well developed septa rather deep in the calice.

Plate 84, figure 7 shows part of a branch from locality 9; in other parts of the same branch the calices are more widely spaced.

Syntypes.—Locality 9, four specimens; locality 33, one specimen; locality 216, one specimen.

STYLOPHORA GRANULATA Umbgrove, n. sp.
Plate 81, figure 48

The fragments of this species are excellently preserved and permit a full description. Corallum ramose; branches of irregular shape, subcylindrical, diverging in different directions. Diameter at base, 12 mm.; near top, 2 mm. to 4 mm. Calices subcircular, scattered irregularly. Diameter, 1 mm. to 2 mm., usually 1.5 mm.; the walls project slightly. Ten subequal septa reach columella. Septa delicately dentate, slightly exsert and extending nearly horizontally for a distance of about 0.5 mm., then dipping almost perpendicularly in the calicular fossa; from that point extending toward the columella and forming a distinct paliform lobe. Columella well developed, compressed and pointed. Peritheca densely granulated.

Syntypes.—Locality 77.

CYATHOHELIA AXILLARIS Ellis & Solander
Cyathohelia axillaris BEDOT, 1907, Rev. Suisse Zoöl., vol. 115, pl. 5, figs. 1–3.

Many fragments from localities 71, 77, 78 and 92 undoubtedly belong to this very characteristic species. Bedot's description is entirely applicable to the fossil material, which, although broken into small pieces, is well preserved.

Description.—Recent: Japan and Amboina.

COENANGIA POLYGONALIS Umbgrove, n. sp.
Plate 83, figures 1–6

Coenangia is either a subgenus of *Astrangia*, or, more probably, a separate genus closely allied to it. (See Vaughan and Wells, 1943, pp. 176–177.)

Corallum cerioid, an encrusting and creeping cluster of cylindrical or polygonal corallites. Reproduction by buds arising in different ways, either from the lateral walls or from basal stolon-like extensions, or even within the calices. Columella papillary. Corallites mostly fused by their outer walls. Coenenchyma wanting. Dissepimenta slightly developed.

All specimens are encrusting on *Dendrophyllia digitalis* Felix. They consist of small

irregular masses of polygonal calices, in which the individuals are closely packed together and nearly always fused by their outer walls. Only exceptionally a few circular to elliptical corallites occur on the periphery of the colony (pl. 83, fig. 2). Mostly the corallites project 4 mm. to 5 mm. above the base of attachment. Diameter of full grown calices, 5 mm. to 8 mm.; average, 6 mm. to 7 mm. Septa mostly in three complete cycles and generally a few short to rudimentary ones of a fourth cycle. Septa in well developed and deep calices (pl. 83, fig. 1), steeply dipping into calicular fossa. Septa of neighboring calices alternate. Septal edges dentate, those of the first cycle and a few of the second cycle having either a very prominent nearly vertical dental lobe or extending as a whole above the surface of the calicular walls. Septa of later cycles may be fused with primaries or secondaries. Scattered granules occur on lateral faces of septa. Columella composed of abundant papillae on reticular extensions of the septa. A few paliform lobes are usually present. The columellar papillae may be fused into a mass of glassy appearance. Plate 83, figure 5 shows a bud within a calice.

This species resembles *C. conferta* from the Gulf of California in growth shape, calices, and number and arrangement of septa but it differs mainly by having a papillary columella.

Syntypes.—From locality 45, 27 specimens; from locality 62, 22 specimens; from locality 75, one specimen.

PROGYROSMILIA REGULARIS Umbgrove, n. sp.
Plate 84, figures 1, 2

Corallum massive; surface applanate or slightly convex. Corallites regularly circular, exceptionally slightly elongate. Asexual reproduction by intercalicinal budding. Diameter of average-sized calices, 2.5 mm. to 3 mm. No true corallite walls; walls formed by thickening of septa. Corallites not widely distant but separated by a vesicular peritheca which is evident if surface of corallum is slightly worn. In full grown calices ten to 12 septa reach the fossa and a cycle of short to rudimentary septa occurs. Septa finely serrate.

On surface of corallum a few septocostae are continuous between adjacent calices, the others forming an intricate pattern between the corallites. Columella absent or formed by a few septal trabeculae which may be seen from the surface of the colony, but deeper in the calices a small pseudocolumella is always present. Dissepimenta well developed at distances of from 1 mm. to 1.5 mm. or less. This species differs from *P. vacua* (Gerth) by its regularly shaped and smaller calices.

Syntypes.—Two fragmentary specimens, locality 37.

GYROSMILIA DIADEMA Umbgrove, n. sp.
Plate 84, figures 4–6

Corallum with flat, slightly concave subcircular noncalicinal surface. Diameter of base, 110 mm. Calicinal surface convex, hemispherical. Height of corallum, 70 mm. Valleys usually continuous, radiating from centre of corallum towards periphery, 10 mm. to 26 mm. (usually 12 mm.) in width measured between vertical margins of septa; depth, 20 mm. to 25 mm. Collines swollen, rounded.

On summit of collines about ten septa per centimeter usually continuous over colline, sometimes angular. At distances of 5 mm. to 15 mm. (usually 10 mm.) thickened septa occur, the latter being more exsert than the other septa and either continuing across a valley or curving to left or right towards calicular center. Septal margins and costae on non-calicinal surface distinctly covered with rough granuliform dentations; sides of septa with small granules arranged in rows perpendicular to septal margin. Columella trabecular, deep in calicular centers, usually indistinct. Endothecal dissepiments distinct, in places crowded, visible in worn places. Center of non-calicinal surface covered by attached rock material. Remains of a thin epitheca preserved.

I refer this species to *Gyrosmilia* Edwards & Haime, whose only described representative is the recent *G. interrupta* Ehrenberg which was redescribed by Klunzinger and by Matthai. The present species differs from this not only by its habitus, growth-type and dimensions of collines, but also by the

presence of a pseudocolumella in some of the calicular centers which may be due to the fact that in preparing the fossil specimen some of the septal margins were broken off and thus the columellar trabeculae came to view. It is not impossible that they also may be present in *G. interrupta*. It seems to me that *Ctenella laxa* described by Matthai (1928, p. 172) is another allied form. The arrangement of the valleys and collines in the small specimen figured by Matthai in his plate 23, figure 7 much resembles the fossil specimen. According to Matthai, *Ctenella* is characterized by a lamellar columella. However, judging from Matthai's figures, *C. laxa* has an indistinct columella composed of compact septal trabeculae. In this respect also the fossil specimen resembles *C. laxa*, although it seems different from the only full grown specimen figured by Matthai (pl. 49, fig. 4). In my opinion, *C. laxa* may be the same as *Gyrosmilia interrupta*, but a larger suite of specimens is necessary to settle this question. *Montigyra* shows some resemblance to *Gyrosmilia* and may be an allied form although the character of its septa more closely resembles *Trachyphyllia* and *Callogyra*. The growth shape of *G. diadema* resembles *Leptoria hydnophoroidea* Duncan from the Ranikot group of Sind, but the latter differs not only by its much sharper collines but especially by the presence of "a distinct thin lamellate columella, which is very continuous" and doubtless belongs to a different genus.

Holotype.—Locality 54.

Acanthastrea cf. hemprichii (Ehrenberg)

Favia hemprichii Matthai, 1914, Linnean Soc. London Trans., ser. 2, vol. 17, p. 110, pl. 27, figs. 1, 2, 4, pl. 36, fig. 3 (with synonymy).
Acanthastrea hemprichii Faustino, 1927, Philippine Bur. Sci. Mon. 22, p. 163, pl. 44, fig. 1; Thiel, 1932, Mus. R. Hist. Nat. Belgique Mem. 2, p. 51; Yabe, Sugiyama and Eguchi, 1936, Tohoku Imp. Univ. Repts., Spec. vol. 1, p. 48, pl. 57, fig. 4.

A single fragment of a large, massive colony from locality 32 cannot be identified with certainty because the septal edges are damaged. In all other respects, however, this coral agrees well with Matthai's description of *A. hemprichii*.

Oulastrea praecrispata Umbgrove, n. sp.

Plate 84, figures 9, 10

The holotype is a fragment of a massive colony with an undulating surface. Calices very close together, projecting very little, not deep, circular or slightly deformed. Diameter of calices 5 mm. to 10 mm., averaging 8 mm. Walls extremely thin, not visible on the surface, obscured by confluent or alternating septocostae, which produce a rough appearance because of the numerous denticulations of different sizes. The teeth are very close together, unequal, noduliform when viewed from above, and some are slightly ramifying. Columella papillose, formed by the innermost teeth of the septa. Septa mostly in three cycles and a few of the fourth cycle. Commonly eight or nine septa are stronger than the others and a few are only rudimentary. Two young calices formed by intercalicular gemmation show two complete cycles of septa and a few of the third cycle. Dissepiments thin, at distances of 1 mm. This species seems closely allied to the recent *O. crispata* (Lm.). It differs by (1) its growth shape. (2) the shallowness of its calices, (3) the larger average diameter of its calices, and (4) its larger number of septa.

Holotype.—Locality 37.

Fungia fungites (Linné)

The costae of two fragments of a *Fungia* from locality 9 are all crowded with strong smooth spines, which are characteristic of *F. fungites*.

This species, which is widely distributed in the Indo-Pacific region, has been found in the Plio-Pleistocene deposits of Ceram (Umbgrove 1924, p. 12). Gerth (1921, p. 422) reported it from the Upper Tertiary of Java. I have restudied his specimen and cannot agree with his identification. He mentioned a "grobstachelige Beschaffenheit der Unterseite." As a matter of fact, the aboral surface of his specimen is covered up to the central part of the disc with irregular, obtuse and strongly granulated spines. All costae bear spines, but the costae are not very prominent, especially in the center of the disc. It seems to me that this specimen belongs to the *F. repanda* group.

FUNGIA ACTINODISCUS Umbgrove, n. sp.
Plate 82, figures 11, 12

The only specimen is a slightly oval disc, with a greater diameter of 115 mm. and a lesser one of 105 mm. Height of corallum, 35 mm. Aboral surface concave, except for a small protruding area in the center, which, however, is damaged and thus it cannot be ascertained whether there was a scar of attachment or not. Wall imperforate. Costae of equal prominence, distinct from the margin of the disc to the center, slightly lamelliform and covered with small coniform and granulated spines (about nine to 12 per 100 mm.; height, 1 mm.). Oral surface increasing in height. Septa of the lower cycles equal in height and thickness; septa of higher cycles lower and thinner. Higher and lower septa generally alternating. Edges of septa strongly dentate. Teeth triangular, about 2 mm. to 3 mm. wide at base, and 2 mm. to 3 mm. high; about three or four teeth per 10 mm. Septa and teeth densely covered with small but distinct granules. Axial fossa about 30 mm. long. Columella consisting of fine intertwisted trabeculae, not visible from above. The character of the aboral surface and septal denticulation strongly resembles the recent species, *F. actiniformis* Quoy & Gaimard, which, however (although it must be an allied species), never shows a habitus of the oral surface similar to that of this fossil specimen.

Holotype.—Locality 126.

LEPTOSERIS sp.

Only a small fragment of a branched and apparently much dissected frond probably belonging to a Recent species (cf. *Leptoseris gardineri* van der Horst). Specific identification of such a specimen seems inadvisable.

PACHYSERIS COMPACTA Umbgrove, n. sp.
Plate 83, figure 8; plate 84, figure 3

Growth-shape compact. Collines irregularly meandering and sharp-edged. The only Tertiary species having sharp collines is *P. curvata* Martin but the narrow valleys are more like those of recent species. Valleys 2 mm. to 5 mm. wide, mostly 2 mm. to 3 mm. (measured from crest to crest). Septa equal, 13 to 14 in 5 mm., comparatively broad and ending towards the columella in a T-shaped thickening. Synapticulae conspicuous in many places. Columella an interrupted lamella, in many places fused with the septal ends.

Syntypes.—Two specimens, localities 37 and 49.

BALANOPHYLLIA OPPENHEIMI Felix

Balanophyllia oppenheimi FELIX, 1913, Palaeontographica, vol. 60, p. 331, pl. 27, fig. 3; GERTH, 1921, Geol. Reichs-Mus. Leiden Samml., n.f., vol. 1, p. 427, pl. 57, figs. 35, 36; ——, 1925, Leidsche Geol. Meded., vol. 1, p. 49.

Balanophyllia variabilis GERTH, 1921, Geol. Reichs-Mus. Leiden Samml., n.f., vol. 1, p. 427, figs. 31–34.

Some hundreds of specimens show the great variability of this species, mentioned by Gerth in connection with his *B. variabilis*. Comparison with his types in the Geological Museum at Leiden, convinces me that these should be referred to *B. oppenheimi* Felix because among his specimens many show costae as broad and granular as those identifield by him as *B. oppenheimi*. Moreover, the growth shape varies from a slender cone to an irregularly curved and compressed form, and separation into different types cannot be made. In some specimens the spongy structure of the external wall is limited to the basal portions of the older septa, in others, however, it extends over larger parts of the septa. The spongy columella may be thinner and more elongate than mentioned by Felix in his original description of the species.

Distribution.—Upper Neogene: Borneo; Pliocene: Java (Sonde, Duku Pengkol, Garung and Djombang).

DENDROPHYLLIA DIGITALIS Felix

Dendrophyllia digitalis FELIX, 1920, Palaeontologie v. Timor, vol. 8, p. 16.

Dendrophyllia rutteni GERTH, 1922, Geol. Reichs-Mus. Leiden Samml., n.f., vol. 1, p. 429, pl. 57, figs. 27, 28.

I have restudied Felix's type from Timor in the Institute of Mines at Delft and Gerth's types from Java in the Museum of Geology at Leiden and compared them to the present material from the Putjangan beds which consists of hundreds of specimens. *D. rutteni* must be placed among the synonyms of *D. digitalis* because the distribution of calices, the arrangement and number of septa, and the characters of the costae are identical.

HETEROPSAMMIA COCHLEA (Spengler)

Madrepora cochlea SPENGLER, 1741, see *Heteropsammia cochlea* EDWARDS and HAIME, 1860, Hist. Nat. Corall., vol. 3, p. 106.
Heteropsammia rotundata SEMPER, 1872, Zeitschr. Wiss. Zoöl., vol. 22, p. 265, pl. 20, fig. 10.
Heteropsammia ovalis SEMPER, 1872, Zeitschr. Wiss. Zoöl., vol. 22, p. 266, pl. 20, fig. 11; FELIX, 1920, Palaeontologie v. Timor, vol. 8, p. 28, pl. 118, fig. 1; GERTH, 1921, Geol. Reichs-Mus. Leiden Samml., n.f., vol. 1, p. 430, pl. 57, figs. 8, 9.
Heteropsammia cochlea VAN DER HORST, 1922, Siboga Exped. Mon., vol. 16c, p. 66; ——, 1926, Linnean Soc. London Trans., ser. zoöl., vol. 19, p. 51; FAUSTINO, 1927, Bur. Science Manila Mon. 22, p. 236, pl. 76, figs. 7, 8.
Heteropsammia ovalis var. *formosensis* YABE and EGUCHI, 1932, Japanese Jour. Geology and Geography, vol. 10, p. 23, pl. 3, figs. 6–13.
Heteropsammia cochlea var. *alta* YABE and EGUCHI, 1932, Japanese Jour. Geology and Geography, vol. 10, p. 25, pl. 3, figs. 14–19.
Heteropsammia cochlea et var. *alta, formosensis, japonica* YABE and EGUCHI, 1942, Tohoku Imp. Univ. Sci. Repts., vol. 22, pp. 143, 157, pl. 12.

This species is represented by numerous specimens having an elliptical calix with four cycles of septa. One specimen from locality 52, however, shows an almost circular calice, slightly elongated in the direction of the shorter axis of the corallum. The latter must be named *H. cochlea* and the others might be termed *H. ovalis*, but I am very doubtful that such slight differences in growth are of any specific significance. Both "species" have been found together and Yabe and Eguchi named another type *H. ovalis* var. *formosensis* concerning which they stated "our form lies somewhat intermediate between the typical *ovalis* and the recent *H. cochlea*." Moreover, Gardiner's examination of *Heterocyathus aequicostatus* revealed how much the growth shape may vary in a coral living in association with a sipunculid. In my opinion *H. ovalis* must be placed among the synonyms of *H. cochlea*.

Distribution.—Boring at Ngembak, Java (age unknown); Pliocene Fufa beds of Ceram; Upper Tertiary of Taiwan (Formosa) and the Philippines; Recent in the East Indies.

ENDOPACHYS GRAYI Edwards & Haime
Plate 82, figures 1–10; plate 83, figure 7; text-figure 2

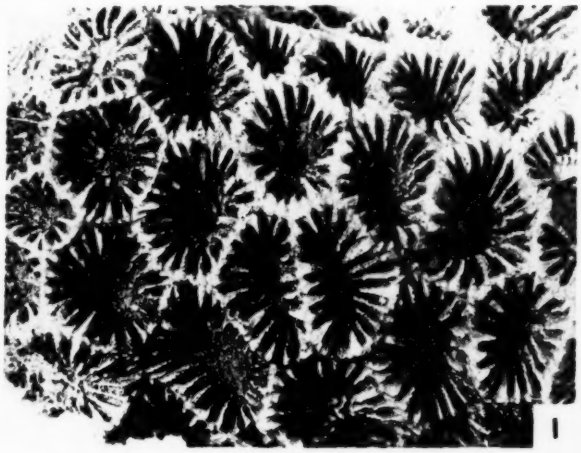
Endopachys grayi EDWARDS and HAIME, 1848, Annales sci. nat., ser. 3, vol. 10, p. 81, pl. 1, figs. 2, 2a; VAN DER HORST, 1922, Siboga Exped. Mon., vol. 16c, p. 68; FAUSTINO, 1927, Bur. Science Manila Bull. 22, p. 240, pl. 77, figs. 1, 2; YABE and EGUCHI, 1942, Tohoku Imp. Univ. Sci. Repts., ser. 2, vol. 22, p. 139.
Endopachys oahense VAUGHAN, 1907, U. S. Nat. Mus. Bull. 59, p. 147, pl. 44, figs. 3, 3a.
Endopachys japonicum YABE and EGUCHI, 1932, Japanese Jour. Geology and Geography, vol. 10, pp. 11–17, pl. 2.
Endopachys vaughani DURHAM, 1947, Geol. Soc. America Mem. 20, pp. 39, 40, pl. 11, figs. 6–8, 10, 11.

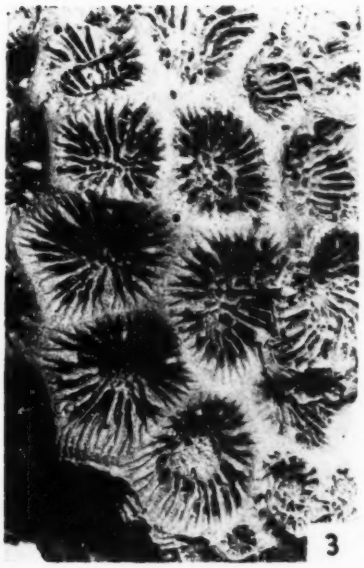
The variability of the growth-shape of this species is great; it includes Vaughan's *E. oahense*, Durham's *E. vaughani* and also *E. japonicum* of Yabe and Eguchi. As a matter of fact, the last of these authors emphasized the variability, especially "in the extension of the lateral wings and the height of the corallum." Moreover, they considered the Japanese fossils to be closely allied to *E. grayi* and *E. oahense* and mentioned three specimens from Taiwan which are "obscurely costated and more compressed at the basal part." For this reason they considered these specimens to be intermediate between *E. grayi* and the Boso specimens of their *E. japonicum* which were selected as types of their new species. On page 16 of their article they stated that *E. japonicum* differs from *E. grayi* and *E. oahense* "chiefly by its smaller size and the different form of the calice, the ratio of the longer and shorter axes of the calice being 170:100 in *Endopachys grayi*, 137:100 in *Endopachys oahense* and 150:100 in the Japanese form."

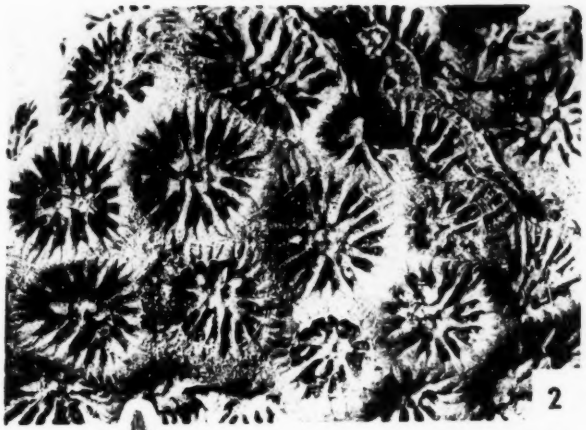
The dimensions of 44 Javanese specimens studied by me vary in such a way as to include the three "species" under discussion and each of the three ratios mentioned by Yabe and Eguchi is based on the measure-

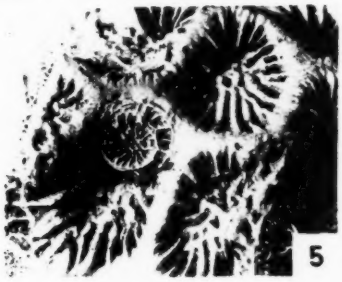
EXPLANATION OF PLATE 83

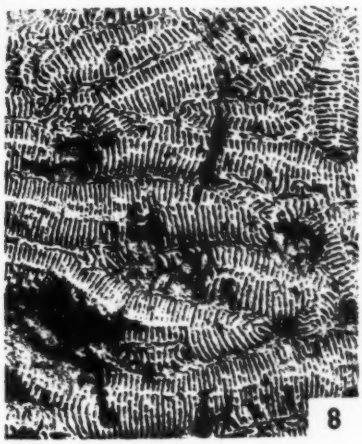
FIGS. *1–6*—*Coenangia polygonalis* Umbgrove, n. sp. *1–5*, ×3; *6*, ×1.5. *1, 2, 4*, Locality 62; *3, 5*, locality 45. (p. 644)
7—*Endopachys grayi* Edwards & Haime. ×3; locality 113. (p. 648)
8—*Pachyseris compacta* Umbgrove, n. sp. ×3; locality 49. (p. 647)



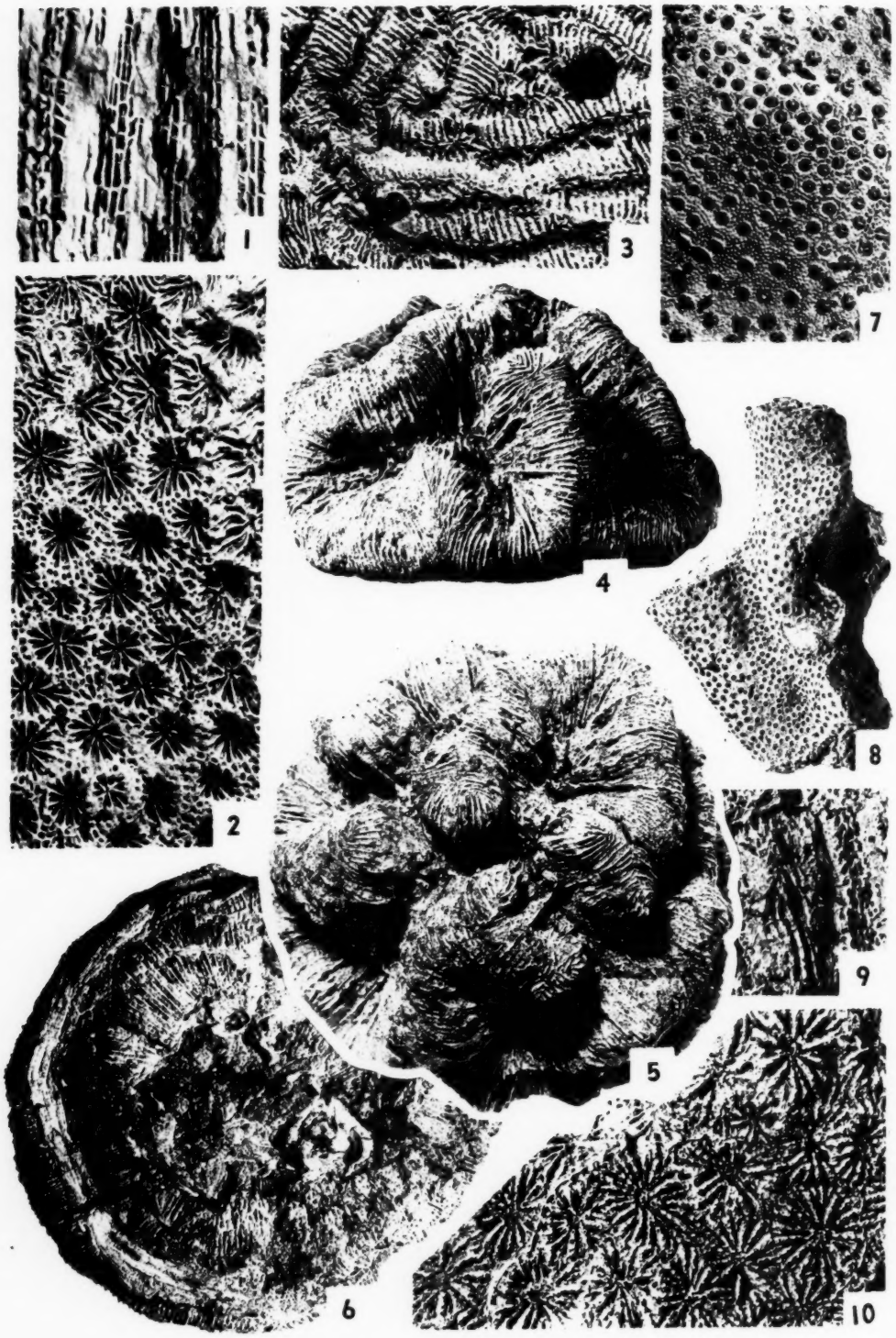








Umbgrove, Lower Pleistocene corals



Umbgrove, Lower Pleistocene corals

ment of one specimen only from which the calicular margin was mostly broken away. Among the fossils from the Putjangan beds three names must be united in the synonymy of *Endopachys grayi*.

Some of the specimens of *E. vaughani* are

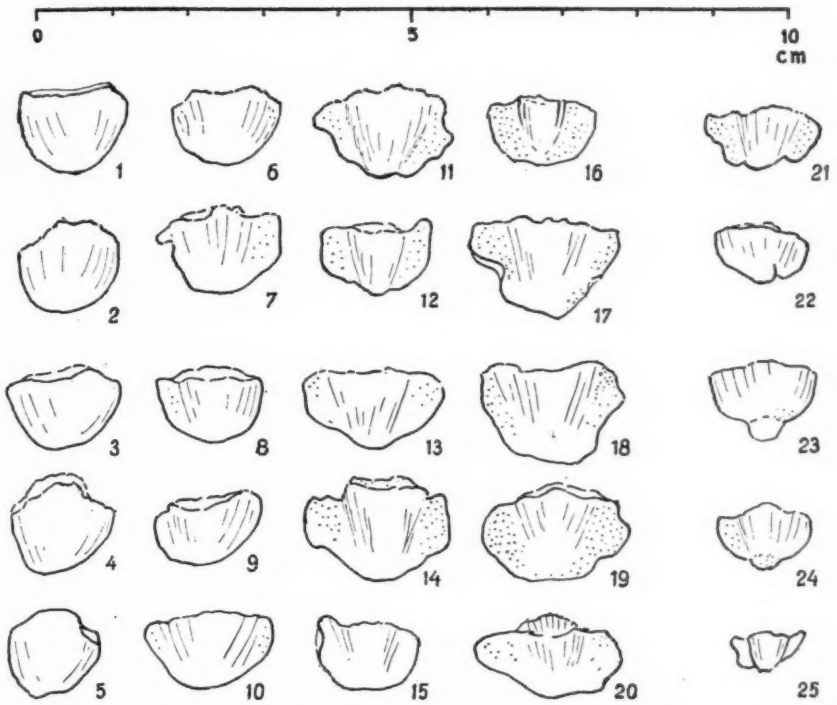


FIG. 2—*Endopachys grayi* from the Putjangan beds, Java. Nos. 5 and 15 are from locality 60; all others from locality 113 (sheet 110A, Geological Survey). Photographs of some of the specimens are reproduced on plates 82 and 83, viz., no. 2: plate 82, figs. 3, 4; no. 5: plate 82, figures 1, 2; no. 13: plate 83, figure 7; no. 14: plate 82, figure 8; no. 15: plate 82, figures 9, 10; no. 20: plate 82, figures 5, 6; and no. 23: plate 82, figure 7.

measurements of three single specimens are as follows: two specimens from locality 113, 6 mm. by 9 mm. (149:100), and 5.5 mm. by 10 mm. (180:100); one specimen from locality 60, 6 mm. by 10 mm. (170:100).

It is quite clear, therefore. that such ratios are not of specific value and because no other characters serve to distinguish them these larger and have septa in five complete cycles. There is no doubt, I think, that they belong to *E. grayi*, because in all other respects they correspond with our specimens from Java.

The 44 specimens from the Putjangan beds of Java were collected as follows: locality 52, two specimens; locality 60, three

---

EXPLANATION OF PLATE 84

FIGS. *1, 2—Progyrosmilia regularis* Umbgrove, n. sp. ×3; locality 37. (p. 645)
3—Pachyseris compacta Umbgrove, n. sp. ×3; locality 37. (p. 647)
4–6—Gyrosmilia diadema Umbgrove, n. sp. ×⅔; locality 54. *4*, Lateral view; *5*, same specimen seen from above; *6*, same specimen, aboral side. (p. 645)
7, 8—Stylophora pocilloporoides Umbgrove, n. sp. Locality 9. *7*, ×3; *8*, natural size. (p. 644)
9, 10—Oulastraea praecristata Umbgrove, n. sp. ×2. locality 37, *9*, Lateral view; *10*, upper surface. (p. 646)

specimens; locality 99, one specimen; locality 113, 38 specimens. Although I am convinced that only one species is represented, the following description is based on the 38 specimens from locality 113 and the others are mentioned separately.

Corallum simple subcuneate, applanate in the direction of longer axis of calice, edges nearly parallel or tapering to the base. Basal margin straight, subangular, obtuse or rounded. Thin, lateral, wing-like crests absent or present (see text-figure 2). Basal attachment scar mostly obliterated; present in a few specimens. Longer axis of corallum varies from 8 mm. to 17 mm.; lesser diameter measured below the calice, 4 mm. to 6 mm.; height of damaged specimens from 4 mm. to 12 mm. (of undamaged specimens, 10 mm.). Fragile upper margin of calice mostly broken off. Wall perforate. No epitheca present.

Costae straight or slightly gyrose, granulate, perforate and corresponding to all septa; equal or subequal, locally alternating in size. Costae mostly comparatively wide and rounded, occasionally subacute and double, seldom distinct near the base. An irregular pattern of small granulae occurs on lateral wings. Intercostal furrows narrow. Septa in four complete cycles and in some specimens members of the fifth present. Septa of the first and second cycles slightly exsert, subequal; those of the higher cycles thinner and forming deltoid groups. Inner ends of septa free or thickened and uniting in a poorly developed, spongy and trabecular columella. Septa with strong granulations and in places perforate. Calicular fossa comparatively long, narrow and deep.

The growth-shape of three specimens closely resembles *E. oahense* and the type of *E. japonicum* as figured by Yabe and Eguchi in their plate 2, figures 1 and 3; others are of the type of their figures 4 to 6. A few are intermediate, and others have stronger wings, occasionally even with undulating lateral crests not previously figured. The outlines of a few specimens are shown in text-figure 2.

Among the specimens from other localities, four are of the *oahense*-type, one is strongly winged, and one is intermediate.

Distribution.—Upper Cenozoic (Philippines, Japan); upper Neogene (Taiwan); Recent, East Indies (Siboga Expedition north of Waigeu, one specimen at a depth of 69 m. to 141 m.), and Oahu (one specimen, depth 53 to 211 fathoms), Gulf of California (13 specimens, 20 to 50 fathoms).

REFERENCES

BEDOT, M., 1907, Madréporaites d'Amboine: Rev. Suisse de Zoölogie, vol. 15, pp. 143–292.

BEETS, C., 1941, Eine jungmiocäne Molluskenfauna von der Halbinsel Mangkalihat: Verh. Geol.-mijnb. genootsch., Geol. ser., vol. 13, pp. 3–220.

BOOMGAART, L., and VROMEN, J., 1936, Smaller Foraminifera from the marl zone between Sonde and Modjokerto: K. Akad. Wetensch., Amsterdam Proc., vol. 39, pp. 419–425.

DURHAM, J., 1947, Corals from the Gulf of California and the North Pacific Coast of America: Geol. Soc. America Mem. 20.

DUYFJES, J., 1936, Zur Geologie des Kendeng gebietes zwischen Trinil und Soerabaja (Java): De Ingenieur in Nederl. Indië, vol. 3, pp. 124–127.

EDWARDS, H., and HAIME, J., 1848–1851, Recherches sur la structure et la classification de polypiers recents et fossiles: Annales sci. nat., 3rd ser., Zoöl., vols. 9–16.

EDWARDS, M., 1857–1860, Histoire naturelle des coraillaires ou polypes proprement dits. Paris.

FAUSTINO, L. A., 1927, Recent Madreporaria of the Philippine Islands: Philippine Bur. of Sci. Mon. 22.

FELIX, J., 1913, Die Fossilen Anthozoen aus der Umgegend von Trinil: Paleontographica, vol. 60.

——, 1920, Jungtertiäre und quartäre Anthozoen von Timor und Obi, II Teil. Palaeontologie von Timor, vol. 8. Stuttgart, Schweizerbart.

——, 1925, Jungtertiäre und quartäre Anthozoen von Timor und Obi, I Teil. Palaeontologie von Timor, vol. 2. Stuttgart, Schweizerbart.

GARDINER, J. S., 1902, South Africa corals of the genus *Flabellum*. Marine investigations in South Africa, vol. 2, pp. 117–154. Cape Town, W. A. Richards and Sons, Government Printers.

GERTH, H., 1922, Anthozoen von Java: Geol. Reichs-Mus. Leiden Samml., n.f., vol. 1, pp. 387–445.

——, 1923, Die Anthozoenfauna des Jungtertiärs von Borneo: Geol. Reichs-Mus. Leiden Samml., ser. 1, vol. 10, pp. 37–136.

——, 1925, Jungtertiäre Korallen von Nias, Java und Borneo: Leidsche Geol. Meded., vol. 1, pp. 22–83.

HORST, C. J. VAN DER, 1922, Eupsammidae: Madreporaria of the Siboga Expedition. Mon. 16c. Leiden, Brill.

——, 1926, Eupsammidae: Linnean Soc. London Trans., ser. 1, vol. 19, pp. 43–53.

——, 1931, Some solitary corals from the Indian Ocean: Indian Mus. Calcutta Rec., vol. 33.

JEANNET, J., and MARTIN, R., 1937, Ueber Neozoische Echinoidea aus dem Niederländisch

Indischen Archipel: Leidsche Geol. Meded., vol. 8, pp. 215–308.

KOENIGSWALD, G. H. R. VON, 1935, Bemerkungen zur fossilen Saügetierfauna Javas: De Ingenieur in Nederl. Indië, vol. 4, pp. 67–70, 85–88 (especially pp. 67 and 69).

——, 1935, Die fossilen Saügetierfaunen Javas: K. Akad. Wetensch. Amsterdam Proc., vol. 38, pp. 188–198.

MARTIN, K., 1921, The age of the Tertiary sediments of Java: First Pacific Sci. Cong., pp. 754–765.

——, 1928, Eine Nachlese zu den Neogenen Mollusken von Java: Leidsche Geol. Meded., vol. 3, pp. 105–129.

——, 1929, Unsere Palaeozoologische Kenntnis von Java. Leiden, Brill.

——, 1932, De ouderdom der sedimentenvan de door Dr. J. Cosijn opgenomen antiklinaal in de residentie Soerabaja: Geol.-mijnb. genootsch. Verh., Geol. ser., vol. 9, pp. 149–151.

MATTHAI, G., 1914, A revision of the recent colonial Astreidae: Linnean Soc. London Trans., ser. 2, zoöl., vol. 17, pp. 1–140.

MOHLER, W. A., 1946, Zur Stratigraphie der Saügetier-führenden Schichten von Java: Experientia, vol. 2, pp. 287–292.

QUOY, E., and GAIMARD, J., 1833, Zoophytes. Voyage de l'Astrolabe, vol. 4. Paris.

REGTEREN ALTENA, C. O. VAN, 1938, The marine mollusca of the Kendeng beds (East Java): Leidsche Geol. Meded., vol. 10, pp. 241–320.

SEMPER, C., 1872, Ueber generationswecksel bei Steinkorallen: Zeitschr. f. Wiss. Zoölogie, vol. 22, pp. 235–280.

STRAELEN, V. VAN, 1938, Crustacés décapodes cénozoiques des Indes Neerlandaises: Leidsche Geol. Meded., vol. 10, pp. 90–104.

THIEL, M. E., 1932, Madreporaria: Mus. royale histoire nat. Belgique, hors sér., vol. 2, pt. 12.

UMBGROVE, J. H. F., 1924, Report on Pleistocene and Pliocene corals from Ceram: Geological and paleontological results of explorations carried out by L. Rutten and W. Hotz, ser. 1, no. 1, pp. 1–22.

——, 1926, Neogene en Pleistocene Koralen van Sumatra: Wetenschappelijke Mededelingen van de Dienst van de Mijnbouw in Nederlands Indië, vol. 4, pp. 25–56.

——, 1929, Anthozoa van Borneo: Wetenschappelijke Mededelingen van de Dienst van de Mijnbouw in Nederlands Indië, vol. 4, pp. 25–56.

——, 1938, Corals from an elevated marl of Talaud: Zoologische Meded., vol. 20, pp. 263–274.

——, 1942, Corals from asphalt deposit of the Island Buton (East Indies): Leidsche Geol. Meded., vol. 13, pp. 29–38.

——, 1945, Corals from the upper Miocene of Tjisande, Java: K. Akad. Wetensch. Amsterdam Proc., vol. 48, pp. 340–344.

——, 1946a, Corals from the upper Kalibeng beds (upper Pliocene of Java): K. Akad. Wetensch. Amsterdam Proc., vol. 49, pp. 87–93.

——, 1946b, Evolution of reef corals in the East Indies since Miocene time: Am. Assoc. Petroleum Geologists Bull., vol. 30, pp. 23–31.

——, 1946c, Corals from a lower Pliocene patch reef in central Java: Jour. Paleontology, vol. 20, pp. 521–542.

VAUGHAN, T. W., 1907, Recent Madreporaria from the Hawaiian Islands and Laysan: Smithsonian Inst. Bull. 59.

YABE, H., and EGUCHI, M., 1932, A new species of *Endopachys:* Japanese Jour. Geology and Geography, vol. 10, pp. 11–27.

——, and ——, 1942, Fossil and Recent simple corals from Japan: Tohoku Imp. Univ. Sci. Repts., 2nd ser., vol. 22, pp. 87–103.

——, SUGIYAMA, I., and EGUCHI, M., 1936, Recent reef-building corals from Japan and the South Sea Islands under Japanese mandate: Tohoku Imp. Univ. Sci. Repts., 2nd ser., spec. vol. 1.

JOURNAL OF PALEONTOLOGY, VOL. 24, NO. 6, PP. 652–666, PLS. 85, 86, NOVEMBER 1950

OSTRACODA FROM MIDDLE DEVONIAN BONE BEDS IN CENTRAL OHIO

GRACE ANNE STEWART
Ohio State University

ABSTRACT—This paper records 29 species and one variety of ostracodes from the Bone beds in the Middle Devonian limestones of central Ohio. With the exception of one species, *Euglyphella spinosa*, n. sp. and some undefinable fragments from Bone bed no. 2 of the Columbus limestone, all forms are from Bone bed No. 3 (*Hadrophyllum* zone of Stauffer) of the Delaware formation. The species are distributed through ten families and 21 genera—nine species and one variety are described as new, and 11 are too poorly preserved for specific identification. The assemblage cannot be linked directly with any described fauna. A scattering of both Onondagan and Hamiltonian forms suggests a transitional development between the two stages.

INTRODUCTION

THE ostracodes described in this paper are part of the microfauna recovered from bone bed rock material used by Dr. John W. Wells in his study of the Middle Devonian Bone beds of Ohio (1944). Since acid was used in breaking down the samples, all calcareous elements have been destroyed, leaving only limonitic and pyritized individuals. The species herein described, therefore, represent only a segment of the complete fauna, although doubtless they give a fairly accurate cross section of the whole. The type material is deposited in the geological museum, Ohio State University.

This paper is the third in a series dealing with the microfossils of the Bone beds. The other two are devoted to the fish remains, by Wells (1944), and the Foraminifera, by Stewart and Lampe (1947). Subsequent papers are planned on the conodonts and plant spores.

The writer is pleased to acknowledge her indebtedness to Dr. Wells for the opportunity of studying this material.

STRATIGRAPHIC AND GEOGRAPHIC DISTRIBUTION

The Middle Devonian rocks of central Ohio consist of two dominantly limestone formations, the Columbus below and the Delaware above, the former considered to be of late Ulsterian age and the latter early Erian. Both formations are abundantly fossiliferous, and descriptions of hundreds of species collected from them, particularly of the macrofossils, may be found scattered through the literature. At certain intervals in the limestones occur, in more or less localized zones, exceptional concentrations of organic material, particularly rich in microorganisms. These zones are known as the Bone beds. In all, five have been recognized, one in Logan County in west central Ohio, and the other four in central Ohio. Two of the latter occur in the Columbus formation and two in the Delaware formation.

Various writers have contributed to the knowledge of these bone beds, the most significant being Orton (1878), who described the bone bed at the top of the Columbus limestone, No. 2; Stauffer (1909) who described No. 3 near the top of the Delaware formation as the *Hadrophyllum* zone; Westgate and Fischer (1933), who added a Fourth bone bed just above the Third; and Wells (1944) who recognized an additional, rather locally developed one, No. 1, about 9 feet below the top of the Columbus formation. The most important beds from the standpoint of physical development and microorganisms are Nos. 2 and 3.

The origin of bone bed layers in sedimentary formations is a matter of much interest and diverse opinion. Perhaps the most penetrating discussion of the problem as applied to the Ohio Middle Devonian beds is contained in the paper by Wells (1944) on the stratigraphy, paleoecology, lithology, and genesis of the Bone Beds. He suggested no single mode of origin for them, but that

TABLE 1.—LOCALITY DISTRIBUTION AND CORRELATION

List of species	Delaware formation—Bone Bed No. 3				Camden chert., Tenn.	Jeffersonville ls., Ky.	Onondaga ls., Pa.	Windom Beds, N.Y.	Widder beds, Ont. Coral zone	Plum Brook sh., Ohio
	Localities									
	7	8	10	12						
Family LEPERDITELLIDAE Ulrich & Bassler										
1. *Isochilina?* sp.		×								
2. *Macronotella* sp.		×								
Family AECHMINIDAE Swartz										
3. *Aechmina equilateralis* Bassler		×			×					
Family DREPANELLIDAE Swartz										
4. *Aechmina longioroidea* Stewart, n. sp.		×								
5. *Bollia hindei* Jones		×	×						×	
6. *Bollia ungula* Jones				×		×	×			
7. *Ulrichia?* sp.				×						
Family HOLLINIDAE Swartz										
8. *Ctenobolbina papillosa* Ulrich		×							×	
9. *Ctenobolbina?* sp.		×								
10. *Hollina delawarensis* Stewart, n. sp.		×								
11. *Hollina* sp.				×						
12. *Hollinella kolmodini* (Jones)				×		×				
13. *Hollinella* sp.		×								
14. *Parabolbina loculosa* Bassler		×								
Family TETRADELLIDAE Swartz										
15. *Ctenoloculina elongata* Stewart, n. sp.		×								
Family KLOEDENELLIDAE Ulrich and Bassler										
16. *Dizygopleura trisinuata* Van Pelt	×	×		×						×
17. *Dizygopleura trisinuata* var.		×								
18. *Kloedenella tumida* Stewart, n. sp.		×								
Family KIRKBYIDAE Ulrich and Bassler										
19. *Amphissites? altireticulatus?* Swartz and Swain	×			×			×			
20. *Amphissites ohioensis*, Stewart, n. sp.		×		×						
21. *Amphissites?* sp.		×								
22. *Kirkbyella unicornis* Coryell & Malkin		×		×?					×	
Family ROPOLONELLIDAE Coryell & Malkin										
23. *Bufina serrata* Stewart, n. sp.		×								
24. *Euglyphella spinosa* Stewart, n. sp.[1]		×		×?						
25. *Euglyphella* sp.				×						
Family QUASILLITIDAE Coryell & Malkin										
26. *Quasillites pentagonus* Stewart, n. sp.		×								
27. *Bairdia?* sp.				×						
Family CYTHERELLIDAE Sars										
28. *Birdsallella delawarensis* Stewart, n. sp.		×		×						
29. *Ponderodictya* sp.		×								
30. *Spinovina* sp.		×								

[1] Questionably present in Bone Bed 2, Loc. 9.

they probably resulted from re-deposition of sedimentary and organic material above wave base in a shallow, fluctuating sea. This may have resulted in a mingling of organisms representing various ecological environments of shallow and deep water, and even fresh water types. The bone bed fossil assemblage, therefore, is a special grouping brought together by unusual physical conditions.

A glance at table 1 reveals that the ostracodes are nearly all from Bone bed No. 3 of the Delaware limestone. Although fragmentary specimens have also been obtained

from Bone bed No. 2, they are worthless for identification and description. Further collecting from this latter zone is planned with a view to obtaining more definite knowledge of Columbus limestone ostracodes. Although ostracodes have been collected from four localities, practically all have come from two, i.e., Nos. 8 and 12, and specimens are not abundant in any sample. The valves are almost always separate, and generally fragmentary, suggesting movement and sorting of the original sediments before consolidation. Perhaps most of these are moults.

ANALYSIS OF FAUNA AND CORRELATION

The collection of ostracodes under consideration contains 29 species and one variety, which are distributed among 21 genera and 11 families. Of these species, only 18 are named, nine being identified with already described species, some questionably, and the other nine are described as reasonably certain new forms. The remaining 11 species are poorly preserved and of uncertain specific relations. This is not, therefore, a varied and abundant fauna either as to individuals or recognizable species. Acid treatment and re-crystallization of the pyrite have destroyed much of the fine surface detail, and so have complicated the study further.

The stratigraphic significance of this assemblage is difficult, if not impossible, to evaluate, because of the poor preservation and because the fauna seems to contain a mixture of both Erian and Ulsterian elements. The peculiar facies condition under which it accumulated may account for the failure to link this fauna with any known described group. Since the Delaware limestone, at least the lower shaly phase, has been rather definitely correlated with the Marcellus on the basis of stratigraphic position and macrofossils, one would expect a lower Erian aspect, and this is apparent in the Hamilton elements that are present. Four species have been identified with forms which are known in beds of Hamilton age elsewhere: *Bollia hindei* Jones, *Ctenobolbina papillosa* Ulrich, and *Kirkbyella unicornis* Coryell and Malkin, all from the Widder beds of Ontario; *Dizygopleura trisinuata* Van Pelt in the Bell shale (Traverse) of Michigan, and the Plum Brook shale (Erian) of Ohio. In addition, genera of notably Hamilton aspect are: *Birdsallella*, *Ponderodictya*, *Spinovina*, *Euglyphella*, *Bufina*, *Amphissites*, *Hollinella*, and *Kloedenella*.

On the other hand, an appraisal of Onondagan or Ulsterian elements reveals that at least six species are identical or closely related to forms of these ages elsewhere. Two species are identified with Camden chert forms from Tennessee: *Aechmina equilateralis* Bassler, and *Parabolbina loculosa* Bassler. Specimens identified as *A. equilateralis* are not exactly similar to the Camden forms but they are near enough to make identification fairly certain. There is likewise a close relationship between *Aechmina longioroidea*, n. sp., and *A. longior* Bassler from the same formation, but the Ohio form is believed to be a different species. The genus *Aechmina* is very common in rocks of Ulsterian age, but differentiation of its various species is very difficult, because differences seem to be so slight. Although only a single left valve of *Parabolbina loculosa* has been found, this form is so distinctive that identification is made with a fair degree of certainty.

All of the Camden chert was originally believed to be of early Oriskany age, but Dunbar (1918) restricted the term to the upper 200 feet of the original formation which he determined to be Onondagan. Bassler (1941) believed that the Camden chert ostracode faunule is distinct from, and older than the Onondaga of central Pennsylvania, and that it is more closely related to the lower Oriskany Shriver chert of Pennsylvania and Maryland. Perhaps, therefore, the gap in time between Shriver chert and Delaware formation is greater than between the Camden chert and Onondaga of Pennsylvania.

The Ohio ostracodes also bear a distinct relationship to the fauna of the Kentucky Jeffersonville limestone which is regarded as a fairly close equivalent of the Onondaga of New York. Three very distinctive species have been identified with a considerable degree of confidence: *Bollia ungula* Jones, *Ctenobolbina papillosa* Ulrich, and *Hollinella kolmodini* (Jones). Swartz (1941) questioned the original identification of Jeffersonville limestone specimens with *B. ungula* but whether this Kentucky form has been

rightly or wrongly identified, it seems fairly clear that the Ohio specimens are closely allied to it, if not conspecific. Considering the fineness of present species concepts, it might be reasonable to separate the American forms under a new species name.

A link with the Onondaga of Pennsylvania is furnished by the presence of two species in common with the Ohio faunule: *Bollia ungula* Jones and *Amphissites? altireticulatus* Swartz and Swain. Swartz and Swain (1941, p. 412) pointed out that of the 35 ostracode species from the Jeffersonville limestone of Kentucky, and the 40 from the Onondaga of Pennsylvania, only one, i.e., *Bollia ungula* Jones, is common to both, and it was doubtfully identified. They believed that this striking dissimilarity indicates a considerable difference in age, and that the Onondaga is probably the older of the two formations.

From the foregoing it is apparent that the Delaware limestone ostracodes have their closest affiliation with faunas of the Jeffersonville limestone of Kentucky and with formations of Hamilton age at several other localities. Future collecting is contemplated from the Columbus limestone, and it is to be hoped that a better understanding of the Ohio Middle Devonian ostracodes may be gained.

Since the orientation of the carapaces of fossil ostracodes still seems to be a matter of individual opinion rather than of established fact, the writer has continued to use the terms right and left valves in conformity with the probable anterior and posterior ends of the shells.

REGISTER OF COLLECTING LOCALITIES
(See Wells, 1944)

No. 7. Scioto quarry (Main or North quarry) of Marble Cliff Quarries Co., north of Hobo quarry, Franklin County. Along west wall of quarry. Third Bone bed. Delaware formation.

No. 8. Junction of McCoy Road and Scioto River Road, east side of Scioto River, 1 mile north of Fishinger Bridge, Franklin County. Roadside exposure. Third Bone bed. Delaware formation.

No. 9. J. and L. Snouffer quarry, east side of Scioto River, 1 mile south of Dublin Road, Franklin County. East wall of quarry. Second Bone bed. Columbus formation.

No. 10. Bartholomew Run, west side of Olentangy River, Delaware County. Exposure in bed of creek at elevation 815 feet. Third Bone bed. Delaware formation.

No. 12. Miami Stone Co. Quarry, west side of Olentangy River, 2 miles north of Bartholomew Run, Delaware County. Near top of exposure at east end of south wall of upper quarry. Third Bone bed. Delaware formation.

SYSTEMATIC DESCRIPTIONS

Family LEPERDITELLIDAE Ulrich and Bassler

Genus ISOCHILINA Jones

ISOCHILINA? sp.

Plate 85, figures 1, 2

A few broken valves, too fragmentary for certain determination, are assigned to this genus with question. One specimen, presumably a right valve, is rabetted around the entire free edge for the reception of the edge of the left. Another broken, larger specimen, interpreted as the left valve, exhibits a narrow sulcus on the ventral edge at least, and distinctly above it, probably to accommodate the extended edge of the other valve. All specimens show a straight hinge and have pronounced convexity. No eye spot has been detected on any of them.

Approximate dimensions of largest specimen are: length, 1.34 mm.; height, 1.0 mm.

Third Bone bed, Delaware formation. Locality 8.

Figured specimen.—No. 19575, Geol. Mus., Ohio State Univ.

MACRONOTELLA sp.

Plate 85, figures 3, 4

Three small, straight-backed valves are identified provisionally with this genus. They are sub-triangular in shape, with smooth unsulcated surfaces. Because of their apparent simplicity, orientation is difficult. The surface may have been reticulate originally but there is no evidence of it now. Since the valves are of different sizes, and separate, marginal contact features have not been observed.

The dimensions of the largest valve are: length, 0.58 mm.; height, 0.42 mm.

Third Bone bed, Delaware formation. Locality 8.

Figured specimens.—No. 19576, Geol. Mus., Ohio State Univ.

Family AECHMINIDAE Swartz
Genus AECHMINA Jones and Holl
AECHMINA EQUILATERALIS Bassler
Plate 85, figure 5

Aechmina equilateralis BASSLER, 1941, Jour. Washington Acad. Sci., vol. 31, pp. 24, 25, fig. 14.

Four separate left valves are identified with this species. Although they are not exactly similar, the resemblance is very close. The dorsomedian spine appears to be longer and somewhat more curved, and the ends are slightly sub-equal rather than of identical contour.

The dimensions are: length, 0.96 mm.; height, 0.54 mm.; height of spine, 0.46 mm.

Third Bone bed, Delaware formation. Locality 8.

Hypotype.—No. 19574, Geol. Mus., Ohio State Univ.

AECHMINA LONGIOROIDEA Stewart, n. sp.
Plate 85, figures 6, 7

Shell as viewed from the side subquadrate to semi-elliptical; dorsal edge appearing essentially straight; ends subsymmetrical, anterior slightly blunter than posterior; cardinal angles obtuse, approximately equal; hinge contact of right valve smooth and even, left valve hinge contact unknown; overlap unknown.

Surface of valve with pronounced convexity, flattening somewhat dorsally; dorsomedian spine slightly anterior, large and evenly tapered, curved appreciably forward; ends and ventral margin with tiny, closely-spaced spicules.

Dimensions of a right valve are: length, 0.46 mm.; height, 0.29 mm.; height of spine, 0.33 mm.

The right valve only is known. This simple, perfect little ostracode bears a close resemblance to *Aechmina longior* Bassler, from the Camden chert, Onondaga of Tennessee, but the spine is shorter and stouter, and curved instead of straight.

Third Bone bed, Delaware formation. Locality 8.

Syntypes (two).—No. 19573, Geol. Mus., Ohio State Univ.

Family DREPANELLIDAE Swartz
Genus BOLLIA Jones, 1890
BOLLIA HINDEI Jones
Plate 85, figures 8, 9

Bollia hindei JONES, 1890, Geol. Soc. London Quart. Jour., vol. 46, p. 540, pl. 20, fig. 2. SWARTZ and SWAIN, 1941, Geol. Soc. America Bull. 52, p. 419, pl. 3, fig. 5a–f.

Some individual valves have been collected which exhibit the distinctive features of this species. Shells are sub-triangular to semi-elliptical in lateral view, the ends and ventral marginal areas thick to ventricose. The centrally located loop-like ridge, open dorsally, is well developed, the extremities bulbous, the anterior one being more extended dorsally and more acute than the posterior which is the larger. The ridge is broadest in the antero-ventral region. The median sinus curves backward around the ventral side of the posterior lobe.

All specimens observed have a simple contact edge. They are interpreted as left valves, the right counterparts of which should show a rabetted edge.

Two of the valves are slightly more elongate and possibly are sex dimorphs as suggested by Warthin. However, they were collected at a different locality, but in the same stratigraphic bed. This fact makes me question the validity of Warthin's interpretation.

The reader is referred to Swartz and Swain for a complete description of the species.

The dimensions of a specimen which the writer considers a norm for the species are: length, 1.26 mm.; height, 0.84 mm. in anterior third.

Third Bone bed, Delaware formation. Localities 8 and 10.

Hypotypes.—Nos. 19577, 19578, Geol. Mus., Ohio State Univ.

BOLLIA UNGULA Jones
Plate 85, figure 10

Bollia ungula (Claypole) JONES (part), 1889, Am. Geologist, vol. 4, p. 338, fig. 10 (not fig. 11–13). ULRICH, 1891, Cincinnati Soc. Nat. Hist. Jour., vol. 13, p. 188, pl. 14, figs. 6a, b. SWARTZ and SWAIN, 1941, Geol. Soc. America Bull. 52, no. 3, p. 418, pl. 2, fig. 4a–i.

Two separate valves seem to fulfill the requirements of this species, although all features are not sufficiently well preserved

to be certain. The inner loop has the limbs essentially vertical, but the spinelike node at the dorsal end of each is seemingly not developed. There is apparently not a noticeable flattening of the marginal ridge, although the small covering crystals of pyrite no doubt obscure this feature even if it is developed. One of the valves is subquadrate, while the other tends to be more or less semi-elliptical.

Swartz (1941, p. 419) questioned the identification of the Jeffersonville limestone (Falls of Ohio) specimens with this species. If future study should determine that these specimens are not conspecific with the Pennsylvanian form, my opinion is that they should be identified with those from the Falls of the Ohio. The general proportions are more like the Jeffersonville limestone form, and the symmetry of the ends is greater than in the Pennsylvania form.

Hinge features not distinct. Free edge simple, smooth.

Dimensions are: length, 0.84 mm.; height 0.54 mm.

Third Bone bed, Delaware formation. Locality 12.

Hypotype.—No. 19579, Geol. Mus., Ohio State Univ.

Genus ULRICHIA Jones, 1890

ULRICHIA? sp.

Plate 85, figure 11

A single valve suggests the features of this genus but it is entirely too incomplete for certain identification. The central sulcate area is much more prominent than is typical of the genus, and swellings instead of isolated nodes are prominent along either side. The thick ventral edge suggests this may be a female form with brood pouches. Surface detail has been destroyed.

Dimensions are: length, 1.26 mm.; height, 0.84 measured midway between ends.

Third Bone bed, Delaware formation. Locality 12.

Figured specimen.—No. 19580, Geol. Mus., Ohio State Univ.

Family HOLLINIDAE Swartz

Genus CTENOBOLBINA Ulrich, 1890

CTENOBOLBINA PAPILLOSA Ulrich

Plate 85, figure 12

Ctenobolbina papillosa ULRICH, 1891, Cincinnati Soc. Nat. History Jour., vol. 13, p. 186, pl. 15, figs. 8a–c. WARTHIN, 1942, Type Invert. Foss. N. Amer. (Dev.), Beyrichiacea 68.

This distinctive and quite widely distributed Middle Devonian ostracode is represented by only two specimens in the material at hand: a complete left valve, and the posterior portion of a right valve. All features are sufficiently well preserved so that the specimens may be assigned to this species with considerable confidence. The outstanding features of the form are: the three-lobed character due to deeply impressed posterior sulcus and less well impressed anterior sulcus, large and prominent posterior and middle lobes and small less conspicuous anterior lobe, low post-cardinal node, wide well developed flange with smooth surface, deeply concave character of shell between flange and contact edge of valve, and coarsely papillose character of surface.

Measurements of complete specimen (left valve) are: length, 1.34 mm.; height, 0.96 mm. in posterior portion.

Third Bone bed, Delaware formation. Locality 8.

Hypotype.—No. 19585, Geol. Mus., Ohio State Univ.

CTENOBOLBINA? sp.

Plate 85, figure 13

Fragmentary valves of a large ostracode evidently affiliated with this genus have been observed. The hinge is straight, the free edge of one valve at least with grooved margin, and two shallow sulci are present in the posterior half of the valve. The material is not sufficient for certain determination.

Third Bone bed, Delaware formation. Locality 8.

Figured specimen.—No. 19906, Geol. Mus., Ohio State Univ.

Genus HOLLINA Ulrich and Bassler, 1908

Genotype.—Ctenobolbina insolens Ulrich.

Allied to *Ctenobolbina*, but posterior lobe commonly broken up into three or four nodes of which the inner one is the most pronounced and most persistent; middle lobe terminated dorsally in large rounded node and anterior lobe reduced to small node or obsolete; marginal frill confined chiefly to posterior two-thirds; brood pouch undeveloped. Devonian.

HOLLINA DELAWARENSIS Stewart, n. sp.
Plate 85, figures 14, 15

Carapace subelliptical in side view; hinge straight, equal to the greatest length of the shell; cardinal angle acute; posterior angle obtuse, greater than a right angle; hinge of both valves apparently simple with no evidence of overlap; a slight bevelling or faint sulcus occurs along at least the ventral margin of the right valve into which the edge of the left no doubt fits; incipient spines or beading along the bevelled edge of the entire free margin of both valves; ends unequal, the anterior narrowly rounded, the posterior much blunter, thus producing the so-called backward swing at this end of the carapace.

Surface sculpture distinct; two distinct sulci dividing the surface into three primary lobes; the posterior lobe in the female is further divided into two smaller post cardinal nodes, a posterior swelling somewhat ridge-like in character, and expands ventrally into what is evidently a brood compartment; the central lobe is terminated dorsally by a large node or blunt spine (broken in specimens studied), and ventrally swells into a second brood pouch; anterior lobe separated from middle lobe by broad dorsal sulcus, ending antero-dorsally in a broad, low node. The dimorph male counterpart differs in having all the lobation a little more pronounced, and in having the ventral parts of the middle and posterior lobes end in broad flattened spines rather than brood pouch swellings. Smaller details of surface not observed, although possibly it is finely punctate.

Dimensions of two separate valves, male and female, are: male, length, 1.00 mm.; height, 0.63 including flattened ventral spine; female, length, 1.05 mm.; height, 0.59 mm.

This form is known only by three imperfect valves: two right male valves, and the left valve of a female. However, they are so distinctive that they are being recorded in the hope that additional, better preserved specimens may be found later. The writer knows of no Devonian species of the genus with which to compare them. There is a general perfunctory resemblance to *Hollina insolens* (Ulrich) from the Jeffersonville limestone, Falls of the Ohio, but there is no post ventral frill as in that species and the lobing is different; in addition, there is an absence of brood pouches in that form. Although brood pouches have not been hitherto recognized in *Hollina* there seems to be no reason why they might not be developed in certain species of the genus.

Third Bone bed, Delaware formation. Locality 8.

Syntypes (two).—No. 19583, Geol. Mus., Ohio State Univ.

HOLLINA sp.
Plate 85, figure 16

Two incomplete valves, a right and a left, probably belong in this genus. The surface is so imperfect that the character of the lobing cannot be determined definitely. However, the posterior lobe appears to be broken into at least three nodes, and the middle lobe to be extended into a blunt spine; the anterior node is not apparent; posterior end somewhat more bluntly rounded than anterior.

Third Bone bed, Delaware formation. Locality 12.

Figured specimen.—No. 19584, Geol. Mus., Ohio State Univ.

Genus HOLLINELLA Coryell, 1928

Genotype: Hollinella dentata CORYELL 1928, Jour. Paleontology, vol. 2, p. 378, pl. 51, fig. 1. KELLETT 1929, Jour. Paleontology, vol. 3, p. 196–200, pl. 25–26.

Specimens have been recognized in this collection which undoubtedly have a place in this genus, although their true specific character remains somewhat in doubt. The genus, originally erected by Coryell for species of Pennsylvanian age, was later emended by Kellett to include certain Hollinids as old as Devonian. These older forms were said not to have the hinge or marginal features developed to the same degree as in the younger ones. In the specimens under consideration these areas are partially or entirely obscured by secondary crystallization, so their true character cannot be determined. Likewise, minor surface features generally have been destroyed either by secondary crystallization or by the acid bath which all the specimens have gone through.

HOLLINELLA KOLMODINI (Jones)
Plate 85, figures 17, 18

Beyrichia kolmodini JONES 1890, Quart. Jour. Geol. Society, London, vol. 46, p. 538, pl. 20, fig. 6. BASSLER and KELLETT 1934, Geol. Soc. America Spec. Paper 1, p. 333.
Beyrichia (?Drepanella) kolmodini ULRICH 1891, Cincinnati Soc. Nat. History Jour., vol. 13, p. 190, pl. 14, figs. 1a–c.

Several separate valves are being placed with some hesitation in this species. So far as can be observed the marginal frill is inconspicuous, although the free edge of the valve is bevelled and turned under. The anterior lobe is larger than the posterior and more dorsally placed. The sulcus is a little behind the middle of the shell. The ventral swelling or broad ridge, which partly encompasses the posterior lobe, ends anteriorly in a blunt spine. In this feature these specimens differ from the typical form of the species, and also in their rather more elongate character.

Specimens of two distinct sizes are represented, the smaller of which are thought to be males. The larger female specimens do not exhibit a greater development of the frill as interpreted by Kellett. Better preserved material is necessary for an accurate determination of this form.

The dimensions of two specimens are as follows: male, length, 1.34 mm.; height, 0.84 mm.; female, length, 1.60 mm.; height, 0.96 mm.

Third Bone bed, Delaware formation. Locality 12.

Hypotypes (two).—No. 19581, Geol. Mus., Ohio State Univ.

HOLLINELLA sp.
Plate 85, figures 19, 20

One small right valve, believed to be a young male, exhibits most of the distinctive features of this genus. It is roughly rhomboidal in shape, the ends sub-equally rounded, the posterior being blunter; sulcus a little behind middle of the shell; anterior and posterior nodes appear as bulbous terminations of the well-developed ventral ridge; the crest of the ridge appears to be surmounted by incipient spines giving a beaded effect and this is likewise true of the bevelled edge of the valve; cardinal valvular sockets appear to be developed on the hinge, although crystallization generally has obscured the hinge features.

This specimen doubtless represents an undescribed Devonian species, but it is not suitable for the erection of a new species. The loop-like ridge and nodes are reminiscent of the genus *Bollia*, but the bevelled and beaded character of the free edge seems to preclude inclusion in that genus.

The dimensions are: length, 0.63 mm.; height, 0.42 mm.

Third Bone bed, Delaware formation. Locality 8.

Figured specimen.—No. 19582, Geol. Mus., Ohio State Univ.

Genus PARABOLBINA Swartz
PARABOLBINA LOCULOSA Bassler
Plate 85, figure 21

Parabolbina loculosa BASSLER 1941, Jour. Washington Acad. Sci., vol. 31, pp. 22, 25 (fig. 3).

This little form is represented by only one somewhat imperfect left valve. Bassler (1941) commented on the species as follows: "Similar to *P. limbatus* Swartz, 1932, from the Oriskany (Shriver) chert of Pennsylvania, but differing in the more prominent well-rounded node on each side of the dorsal median sulcus, in the long narrow anterior spine, and the frill along the posterior half of the ventral margin composed of four folds forming well-marked loculi."

The anterior spine in the Delaware limestone specimen is curved forward a little, and the hinge and free margin of the inside of the valve present a simple edge unrelieved by bevelling or sulci. The male dimorph has not been recognized.

Dimensions of specimen are: length, 0.84 mm.; height, 0.67 mm.

Third Bone bed, Delaware formation. Locality 8.

Hypotype.—No. 19586, Geol. Mus., Ohio State Univ.

Family TETRADELLIDAE Swartz
Genus CTENOLOCULINA Bassler, 1941
CTENOLOCULINA ELONGATA Stewart, n. sp.
Plate 85, figures 22, 23

Valve elliptical in side view; ends almost equally rounded, the posterior only slightly blunter than the anterior; hinge and free contact margin of valve simple with no suggestion of overlap; posterior cardinal angle

a right angle, anterior cardinal angle slightly less.

Surface of valve marked by four flat-topped, completely separated, finely reticulated ridges, of which the anterior is the lowest and broadest; the surfaces of the ridges are very finely reticulate, and outlined by smooth raised rims; the posterior lobe is convex forward, and the two median ridges which are somewhat undulatory, curve forward at the ventral extremities; all ridges extend beyond both dorsal and ventral margins of the valve with the exception of the anterior ridge at its ventral end; furrows between ridges deep, wide and slanting obliquely backward.

The specimens show a slight bevelling along the free margin which appears as a narrow rim in lateral aspect. There is no suggestion of swellings into brood chambers, which leads to the supposition that these are male specimens.

This species has its closest counterpart in the characteristic Middle Devonian *C. cicatricosa* (Warthin) from which it differs by its much more pronounced ridges, their greater ventral and dorsal extensions, and its more irregular shape.

The dimensions of a valve are: length a little below hinge, 1.01 mm.; height at center, 0.51 mm.

Third Bone bed, Delaware formation. Locality 8.

Syntypes (two).—No. 19587, Geol. Mus., Ohio State Univ.

Family KLOEDENELLIDAE Ulrich and Bassler
Genus DIZYGOPLEURA Ulrich and Bassler
DIZYGOPLEURA TRISINUATA Van Pelt
Plate 86, figures 1–3

Dizygopleura trisinuata VAN PELT, 1933, Jour. Paleontology, vol. 7, p. 328, pl. 39, figs. 61, 62.

Specimens of this species have much of the surface detail obscured by secondary crystallization, but the major features are quite clearly defined. Sulci are deeply impressed and ridges are prominent. In general the shape departs a little from the typical form in the Plum Brook shale by being more attenuate anteriorly. In this they resemble *D. euglyphea* Warthin, a species which in addition is distinguished by an overlapping posterior hinge tooth on the right valve. Specimens of smaller size, which are possibly the male dimorphs, have more equally rounded ends.

Dimensions of a specimen of average size are: length, 1.34 mm.; height, 0.95 mm. in middle of posterior half.

Specimens from Bone bed 3, at locality 12, are intermediate in size between the largest

---

EXPLANATION OF PLATE 85

All figures about ×35 unless otherwise indicated.

FIGS. *1*, *2*—*Isochilina* (?) sp. *1*, Interior of broken right valve. *2*, Exterior view of broken left valve. (p. 655)

3, *4*—*Macronotella* sp. *3*, Right valve of largest specimen observed. *4*, Interior view of small left valve. (p. 655)

5—*Aechmina equilateralis* Bassler. Left valve showing finely serrated margin. (p. 656)

6, *7*—*Aechmina longioroidea* Stewart, n. sp. *6*, Exterior of right valve syntype. *7*, Interior of right valve syntype. (p. 656)

8, *9*—*Bollia hindei* Jones. *8*, Left valve of normal specimen. *9*, Left valve of more elongate, larger, possibly male dimorph. (p. 656)

10—*Bollia ungula* Jones. Somewhat incomplete left valve. (×25) (p. 656)

11—*Ulrichia* (?) sp. Right (?) valve. (p. 657)

12—*Ctenobolbina papillosa* Ulrich. Right valve. (p. 657)

13—*Ctenobolbina* (?) sp. Fragmentary valve. (p. 657)

14, *15*—*Hollina delawarensis* Stewart, n. sp. *14*, Syntype, left valve, female. *15*, Syntype, right valve, male dimorph. (p. 658)

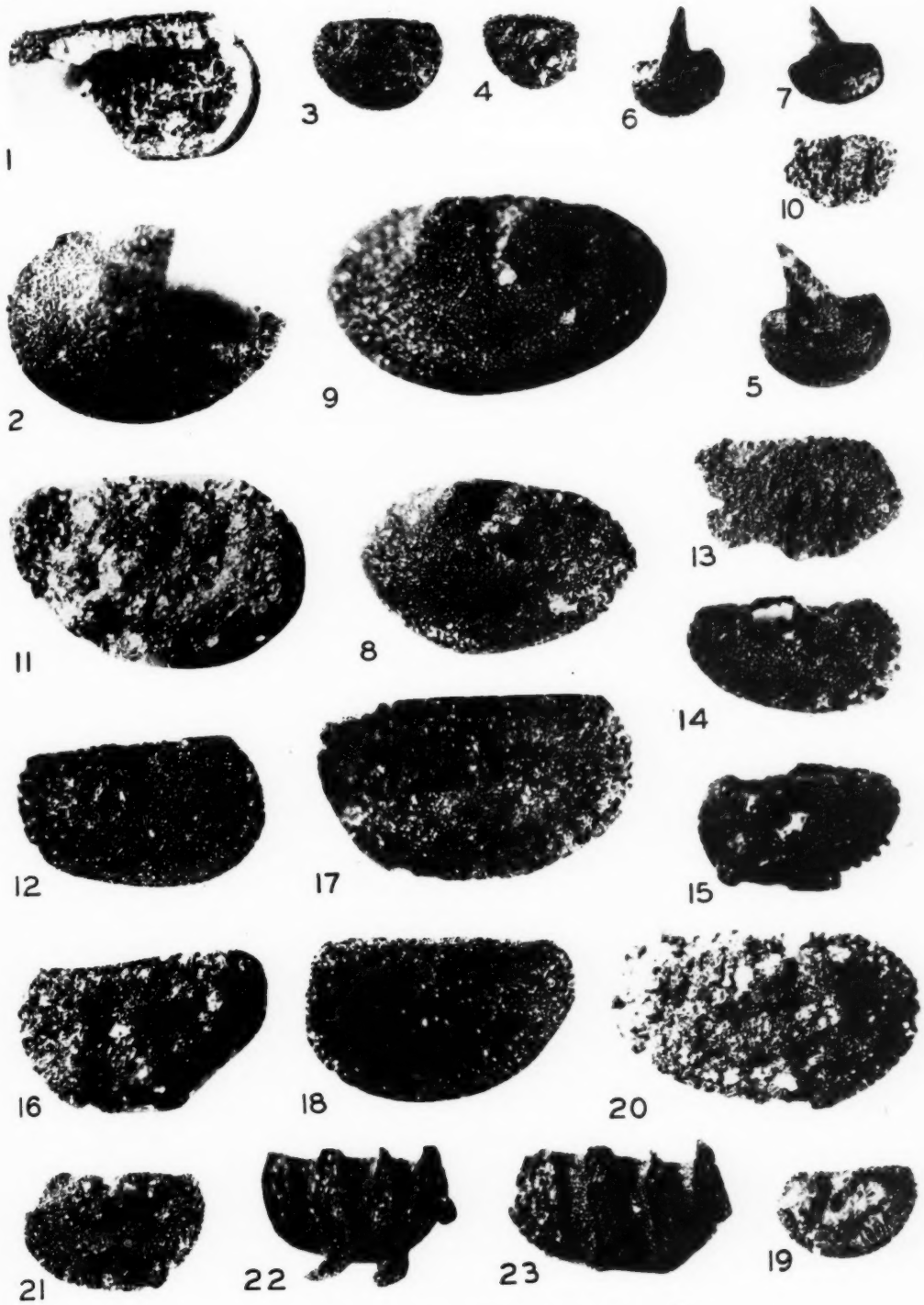
16—*Hollina* sp. Right valve. (p. 658)

17, *18*—*Hollinella kolmodini* (Jones). *17*, Left valve of female specimen. *18*, Interior view of male dimorph. (p. 659)

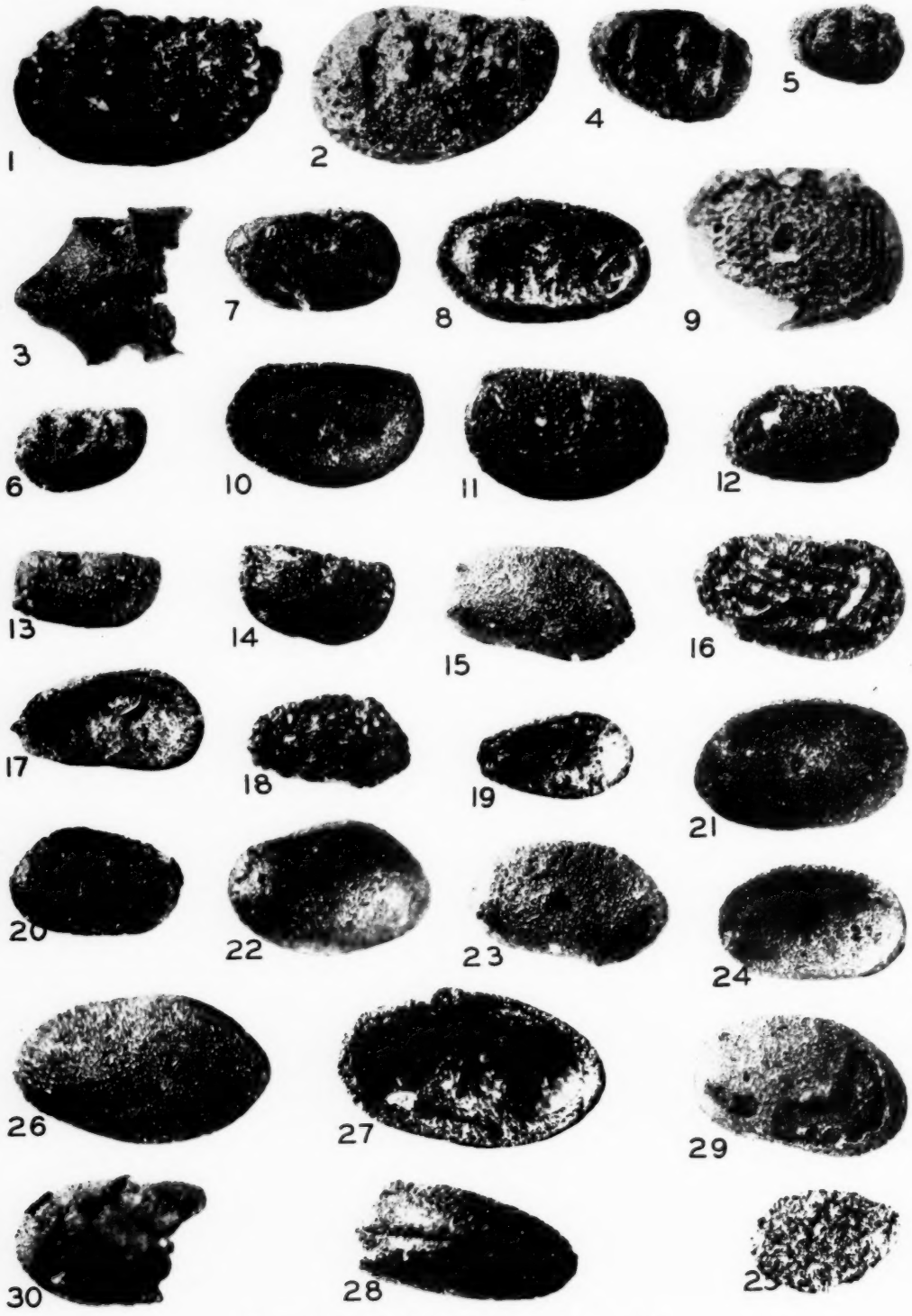
19, *20*—*Hollinella* sp. *19*, Right valve of young male dimorph. *20*, Left valve questionably referred to this species, obscured by pyrite crystals. (×25). (p. 659)

21—*Parabolbina loculosa* Bassler. Left valve of female specimen showing evidence of loculi along ventral margin. (p. 659)

22, *23*—*Ctenoloculina elongata* Stewart, n. sp. *22*, Left valve showing ventral extension of two central ridges. *23*, Left valve of more elongate specimen. Syntypes. (p. 659)



Stewart, Middle Devonian Ostracoda



Stewart, Middle Devonian Ostracoda

and smallest examples from locality 8, and the anterior end is slightly more acute. In only one specimen is there a suggestion of a hinge tooth.

Third Bone bed, Delaware formation. Localities 7, 8, and 12.

Hypotypes (three).—No. 19589, Geol. Mus., Ohio State Univ.

DIZYGOPLEURA TRINSINUATA var.
Plate 86, figures 4–6

Some small specimens appear to be full grown forms rather than the young of *D. trinsinuata*. They differ from larger specimens of the species in having the central and posterior sulci more nearly confluent ventrally, and the anterior ridge proportionately higher and more acute. Because some doubt exists as to whether they are mature adults, it seems best not to propose a varietal name at this time.

The dimensions of a left valve are: length, 0.63 mm.; height, 0.37 mm. in middle of posterior half.

Third Bone bed, Delaware formation. Locality 8.

Figured specimens.—No. 19590, Geol. Mus., Ohio State Univ.

Genus KLOEDENELLA Ulrich and Bassler, 1908

KLOEDENELLA? TUMIDA Stewart, n. sp.
Plate 86, figures 7, 8

Carapace sub-elliptical in side view; dorsal edge essentially straight to moderately convex; ventral margin convex; ends sub-equally rounded, the anterior somewhat attenuate in the upper part, extended into a slight spine a little above the median line; hinge less than the greatest length of the shell, apparently simple; cardinal angles quite obtuse; right valve evidently the larger, and overlapping the bevelled edge of the left valve along the free margin.

Valves convex, thick and tumid anteriorly; two well-developed sulci in the post-dorsal quarter of the valve; the median sulcus terminates ventrally in a well-developed pit and continues dorsally as a shallow depression; posterior sulcus shallow, curving backward below, and dorsally extending obliquely forward and opening into the cardinal area; central area of each valve apparently reticulate and rising platform-like above the contact margin of the

---

EXPLANATION OF PLATE 86

All figures about ×35 unless otherwise indicated.

FIGS. *1–3*—*Dizygopleura trisinuata* Van Pelt. *1, 2*, Two views of right valve with pyrite crystals obscuring fine surface detail. *3*, Anterior hinge. (p. 660)

4–6—*Dizygopleura trisinuata* var. *4, 5*, Two right valves. *6*, Left valve. (p. 661)

7, 8—*Kloedenella tumida* Stewart, n. sp. *7*, Exterior left valve of syntype. *8*, Interior left valve of syntype. (p. 661)

9—*Amphissites? altireticulatus* Swartz and Swain (?). Left valve of incomplete specimen. (p. 662)

10, 11—*Amphissites ohioensis* Stewart, n. sp. *10*, Interior left valve. *11*, Exterior right valve. Syntypes. (p. 662)

12—*Amphissites ?* sp. Right? valve of incomplete specimen. (p. 662)

13, 14—*Kirkbyella unicornis* Coryell and Malkin, Left and right valves. (p. 662)

15—*Bufina serrata* Stewart, n. sp. Left valve of holotype. (p. 663)

16, 17—*Euglyphella spinosa* Stewart, n. sp. *16*, Left valve of syntype showing nature of surface sculpture. *17*, Interior of right valve syntype. (p. 663)

18, 19—*Euglyphella* sp. *18*, Exterior left valve. *19*, Interior right valve. Features obscured by pyrite crystals. (p. 664)

20–24—*Quasillites pentagonus* Stewart, n. sp. *20, 21*, Right valves, exteriors. *22*, Right valve, interior. *23*, Left valve, exterior. *24*, Left valve, interior. Syntypes. Spines and ridges obscured in illustrations. (p. 664)

25—*Bairdia ?* sp. Separate valve, surface features obliterated by pyrite crystals. (×25). (p. 664)

26–28—*Birdsallella delawarensis* Stewart, n. sp. *26*, Right valve of holotype. *27*, Hinge of paratype. *28*, Interior of left valve paratype. (p. 664)

29—*Ponderodictya* sp. Right valve. (p. 665)

30—*Spinovina* sp. Left valve of incomplete specimen. (p. 665)

valve, bordered by a ridge which is best developed at the anterior end.

The dimensions are: length, 0.79 mm.; height, 0.42 mm.

Separate valves only are known. The species is only provisionally referred to *Kloedenella* because the elevated platform and thick anterior are not commonly recognized characteristics of the genus.

Third Bone bed, Delaware formation. Locality 8.

Syntypes (two).—No. 19588, Geol. Mus., Ohio State Univ.

Family KIRKBYIDAE Ulrich and Bassler
Genus AMPHISSITES Girty, 1910
Plate 86, figure 9

Amphissites (?) *altireticulatus* (?) SWARTZ and SWAIN 1941, Geol. Soc. America Bull. 52, p. 429, pl. 4, fig. 3a–i, and pl. 8, fig. 2.

Three or four imperfect and poorly preserved separate valves probably belong to this species, although additional and better preserved material is necessary for certain confirmation. The most complete specimen is characterized by a deep central kirkbyan pit, and coarse reticulations which become somewhat finer toward the shell margins and roughly parallel them. The surface of the valve is somewhat flattened but rises abruptly from the free margins, there being no evidence of a non-pitted border. Because of the absence of this latter feature it is possible these specimens might be referred more accurately to *Amphissites ulrichi* Bassler from the Onondaga chert of west Tennessee, which has the coarse reticulations continuing to the border of the valve.

Third Bone bed, Delaware formation. Localities 7 and 12.

Hypotype.—No. 19591, Geol. Mus., Ohio State Univ.

AMPHISSITES OHIOENSIS Stewart, n. sp.
Plate 86, figures 10, 11

Valves sub-oblong in lateral aspect; ends sub-equally rounded, the posterior being the broader of the two; dorsal margin straight, cardinal angles blunt, the anterior angle the more obtuse; ventral margin gently and evenly curved; a narrow plane border paralleling the free margins forms a false keel; hingement features not determined.

Surface of valves moderately convex, somewhat flattened on top, finely reticulate, the rows of reticulations roughly following the margins and becoming smaller in size near the edge; kirkbyan pit small but distinct, a little in front of the center, not outlined by a definite rim, equal in size to two or three reticulations.

Dimensions of a right valve are: length, 0.92 mm.; height, 0.58 mm.

This form approaches *A. ulrichi* Bassler in its general features but the reticulations are much finer and arranged with more uniformity, the pit is considerably more off center, and the outline is a little different. Only separate valves have come under observation.

Third Bone bed, Delaware formation. Localities 8 and 12.

Syntypes (two).—No. 19592, Geol. Mus., Ohio State Univ.

AMPHISSITES? sp.
Plate 86, figure 12

Although not sufficient for definite determination, one incomplete valve is recorded because it is quite different from associated species of the genus. It lacks the characteristic marginal keel of *Amphissites* except at one end where the shell is extended and marked by small reticulations. The remainder of the surface is covered with very coarse reticulations and the kirkbyan pit is centrally located below the middle of the valve. Shell surface has pronounced convexity.

Third Bone bed, Delaware formation. Locality 8.

Figured Specimen.—No. 19593, Geol. Mus., Ohio State Univ.

Genus KIRKBYELLA Coryell and Booth 1933

KIRKBYELLA UNICORNIS Coryell and Malkin
Plate 86, figures 13, 14

Kirkbyella unicornis CORYELL and MALKIN, 1936, Amer. Mus. Novitates 891, p. 5, fig. 13.

Two limonitic specimens, a right and left valve respectively, are identified with this Hamilton species from Ontario. The valves seem to be thicker ventrally than in Coryell and Booth's specimens and the spine is more bulbous, but otherwise they are quite similar. The reticulate surface is

mostly destroyed but small remnants are visible on the larger valve.

The dimensions of the specimens are: length, 0.76 and 0.84 mm.; height, 0.42 and 0.46 mm.

Third Bone bed, Delaware formation. Locality 8. Specimens of questionable identity from locality 12.

Hypotypes (two).—No. 19594, Geol. Mus., Ohio State Univ.

Family ROPOLONELLIDAE Coryell and Malkin

Genus BUFINA Coryell and Malkin, 1936

BUFINA SERRATA Stewart, n. sp.

Plate 86, figure 15

Carapace semi-ovoid; dorsal margin convex; ventral margin slightly concave at mid-length; anterior margin narrowly and bluntly rounded; posterior margin broader, and somewhat acute at mid-length; cardinal angles obtuse; nature of marginal contact not definitely determined.

Surface of valves moderately convex; greatest height a little posterior to the center; two moderately blunt spines, directed approximately at right angles from the surface, are situated close to the anterior margin, the ventral one being larger and longer; a short prominent ridge occurs on the dorsal posterior slope near the margin and more or less paralleling it; otherwise the surface is smooth, or it may have originally been ornamented with fine anastomosing lines; small spines extend as tooth-like projections from both ends of the shell.

The dimensions of a left valve are: length, 0.88 mm.; height, 0.50 mm. in middle of posterior half.

Although this species is represented by few specimens it seems to be different from any described form. In comparison with *B. elata* Coryell and Malkin from the Hamilton of Ontario, it has less robust spines and ridge, both ends are spinose instead of only the posterior, and the dorsal margin is arcuate instead of straight.

Third Bone bed, Delaware formation. Locality 8. Some specimens from locality 12 may belong in this species but their surface features have been too thoroughly obscured by secondary crystallization to make exact determination possible.

Holotype.—No. 19597, Geol. Mus., Ohio State Univ.

Genus EUGLYPHELLA Warthin, 1934

EUGLYPHELLA SPINOSA Stewart, n. sp.

Plate 86, figures 16, 17

Carapace semi-elliptical in general outline; dorsal and ventral margins with slight concavities at mid-length, but essentially straight and converging anteriorly; anterior end narrowly rounded and somewhat acute, with flattened, projecting spine in the middle; posterior margin broadly rounded, most extended at mid-length; cardinal angles obtuse, the anterior without noticeable angularity; right valve larger, with edges grooved for the reception of the smaller left valve which it overlaps to the greatest extent in the post-cardinal and anterior regions.

Valves moderately convex; ornamented by transverse looping carinae; inner carina with summit distinctly acute and inclined obliquely forward where it joins the curving acute anterior ridge; outer carina a lower and broader ridge more or less continuously paralleling the posterior margin and the posterior two-thirds of the ventral and dorsal margins of the valve; rectangular pits occupy the space between the ridges; anterior and posterior margins spinose and produced into narrow, flattened rims.

Dimensions of a complete specimen are: length, 1.09 mm.; height, 0.58 mm. in middle of posterior half.

The pitting between the carinae obscures their broad C-shaped arrangement, so that there is a striking resemblance to certain species of *Octonaria*.

This species finds its closest counterpart in *E. projecta* Coryell and Malkin. It differs by the presence of the anterior marginal spine, the different pattern of the ridges, and the greater development of intercarinal pits.

Third Bone bed, Delaware formation. Locality 8. Specimens of doubtful affiliations have also been recovered from locality 12, and from Bone bed No. 2, locality 9. The shape of these, however, is more distinctly *Octonaria*-like and the pitting is somewhat finer. They are not sufficiently well preserved for more certain determination.

Syntypes (two).—No. 19595, Geol. Mus., Ohio State Univ.

EUGLYPHELLA sp.
Plate 86, figures 18, 19

Three small separate valves have the characteristic shape of *Euglyphella* but obliteration of most of the surface features makes specific determination impossible. Minute spines ornament the margins at both ends. The absence of a large anterior spine and the smaller size separate these specimens from *E. spinosa* n. sp.

Third Bone bed, Delaware formation. Locality 12.

Figured specimens (two).—No. 19596, Geol. Mus., Ohio State Univ.

Family QUASILLITIDAE Coryell and Malkin
Genus QUASILLITES Coryell and Malkin, 1936
QUASILLITES PENTAGONUS
Stewart, n. sp.
Plate 86, figures 20–24

Carapace subrhomboidal to subpentagonal in side view; dorsal edge straight to gently convex, rising above the hinge contact but evidently not overlapping on either side although the left valve appears to be grooved along the hinge and cardinal edges for reception of the right; left valve has cardinal angles evenly rounded, right valve has posterior cardinal angle broadly obtuse, but anterior cardinal angle more nearly approaching a right angle; ventral margin gently convex, curving evenly to the ends; posterior end extended most in the middle, giving a truncated appearance to both upper and lower parts; anterior margin narrowly rounded, most extended somewhat above the middle; greatest length of carapace midway between upper and lower margins; greatest height in the posterior third; right valve larger and apparently grooved at the ends and ventral margin for the edge of the left.

Surface markings consist of a well-developed blunt anterio-ventral spine, a short distinct obliquely-placed posterior ridge on the left valve and two small anterior spines on the larger right valve. The finer surface markings have been destroyed but there are suggestions on at least two valves of fine anastomosing ridges and a central muscle area in each valve.

Dimensions of a right valve are: length, 1.05 mm.; height, 0.63 mm. in middle of posterior half.

These specimens are referred to *Quasillites* with some question because the finer surface markings are insufficiently known. Although the valves have not been found in contact and the stronger surface sculpture of the two valves is not the same, the writer believes that they represent a single species. The surface sculpture of all left valves is identical and this is true of the right valves. All specimens were obtained from the same zone at the same locality.

Third Bone bed, Delaware formation. Locality 8.

Syntypes (two).—No. 19598, Geol. Mus., Ohio State Univ.

Family BAIRDIIDAE Sars
Genus BAIRDIA M'Coy, 1844
BAIRDIA? sp.
Plate 86, figure 25

Several specimens of uncertain generic and specific affinities are referred provisionally to *Bairdia*. Probably more than one species is represented. At least four specimens have the characteristic *Bairdia* outline, although in the others this is less obvious. Surface features are entirely obliterated by pyrite crystals.

Third Bone bed, Delaware formation. Locality 12.

Figured specimen.—No. 19599, Geol. Mus., Ohio State Univ.

Family CYTHERELLIDAE Sars
Genus BIRDSALLELLA Coryell and Booth, 1933
BIRDSALLELLA DELAWARENSIS
Stewart, n. sp.
Plate 86, figures 26–28

Carapace cytherelloid in lateral aspect, ellipsoidal in dorsal or ventral view; maximum length midway between upper and lower margins, greatest height and thickness in the middle of the anterior half; cardinal angles obtusely rounded; dorsal margin convex with a shallow elliptical sulcus along the anterior hinge area; ventral margin slightly convex to faintly emarginate in the central area; anterior margin broadly

rounded, in some specimens a little attenuate in the middle; posterior margin more narrowly rounded.

Left valve the larger, with pronounced overlap around the entire margin, grooved for the reception of the bevelled edge of the smaller right valve. Anterior end with distinct curving ridge convex forward a short distance in from the margin; posterior slope of side long and gentle, anterior slope abrupt and short; in some specimens ridge on left valve not quite so conspicuous as on the right, a little more vertical in position; in dorsal aspect valves appear somewhat flattened; surface probably granulose originally; some specimens show indications of a smooth muscular area in the middle of the valve.

Specimens of two distinct sizes are present and in the opinion of the writer the larger specimens are females and the smaller ones males.

Dimensions of a right valve of larger size are: length, 1.63 mm.; height, 0.63 mm.

This species is the most abundant one in the entire collection. Although some variability in the shape and convexity of the valves occurs all are believed to represent a single species. The specimens are all separate valves with the exception of one entire shell. Finer surface detail is generally lacking.

Third Bone bed, Delaware formation. Localities 8 and 12.

Holotype and *paratypes* (two).—Nos. 19902 and 19903, Geol. Mus., Ohio State Univ.

Genus PONDERODICTYA Coryell and Malkin, 1936
PONDERODICTYA sp.
Plate 86, figure 29

Two separate right valves are identified with this genus with some question. Most of the surface detail is destroyed although one specimen reveals vestiges of reticulation. There are two posterior spines, of which the ventral one is the larger. The dorsal margin is arcuate, and the ventral margin emarginate, features characteristic of *Ponderodictya*. The hinge is grooved for the reception of the other valve.

Third Bone bed, Delaware formation. Locality 8.

Figured specimen.—No. 19600, Geol. Mus., Ohio State Univ.

Genus SPINOVINA Coryell and Malkin, 1936
SPINOVINA sp.
Plate 86, figure 30

A portion of a left valve probably belongs in this genus, although it is quite inadequate for certain determination. The fine finger-print like markings, central smooth spot, and antero-ventral spine are features of generic distinction. However, this appears to be the larger, overlapping valve, whereas the right valve is larger in this genus. The specimen resembles *S. distributa* Coryell and Malkin.

Third Bone bed, Delaware formation. Locality 8.

Figured specimen.—No. 19901, Geol. Mus., Ohio State Univ.

REFERENCES

BASSLER, R. S., 1941, Ostracoda from the Devonian (Onondaga) chert of west Tennessee: Washington Acad. Sci. Jour., vol. 31, pp. 21–27, 37 figs.

—— and KELLETT, BETTY, 1934, Bibliographic index of Paleozoic Ostracoda: Geol. Soc. America Special Paper 1.

CORYELL, H. N., and MALKIN, D. S., 1936, Some Hamilton ostracodes from Arkona, Ontario: Am. Mus. Nat. History Novitates 891.

DUNBAR, CARL O., 1918, Stratigraphy and correlation of the Devonian of western Tennessee: Am. Jour. Sci., vol. 46, pp. 732–756.

ORTON, EDWARD, 1878, Geology of Franklin County: Ohio Geol. Survey, vol. 3, pt. 1, pp. 596–646.

STEWART, GRACE A., 1936, Ostracodes of the Silica shale, Middle Devonian of Ohio: Jour. Paleontology, vol. 10, pp. 739–763.

—— and HENDRIX, WILLIAM E., 1945, Ostracoda of the Plum Brook shale, Erie County, Ohio: Jour. Paleontology, vol. 19, pp. 87–95.

—— and HENDRIX, WILLIAM E., 1945, Ostracoda of the Olentangy shale, Franklin and Delaware Counties, Ohio: Jour. Paleontology, vol. 19, pp. 96–115.

—— and LAMPE, LOIS, 1947, Foraminifera from the Middle Devonian Bone beds of Ohio: Jour. Paleontology, vol. 21, pp. 529–536, pls. 78 and 79.

STAUFFER, C. R., 1909, The Middle Devonian of Ohio: Ohio Geol. Survey, 4th ser., Bull. 10.

SWARTZ, F. M., 1933, Dimorphism and orientation in ostracodes of the family Kloedenellidae from the Silurian of Pennsylvania: Jour. Paleontology, vol. 7, pp. 231–260.

—— and SWAIN, F. M., 1941, Ostracodes of the Middle Devonian Onondaga beds of central

Pennsylvania: Geol. Soc. America Bull. 52, pp. 381–458.

—— and ORIEL, STEVEN S., 1948, Ostracoda from Middle Devonian Windom beds in western New York: Jour. Paleontology, vol. 22, pp. 541–566.

ULRICH, E. O., 1891, New and little known American Paleozoic Ostracoda: Cincinnati Soc. Nat. History Jour., vol. 13, pp. 173–211.

——, 1900, New American Paleozoic Ostracoda: Cincinnati Soc. Nat. History Jour., vol. 19, pp. 179–186.

VAN PELT, H. L., 1933, Some ostracodes from the Bell shale, Middle Devonian of Michigan: Jour. Paleontology, vol. 7, pp. 325–342.

WARTHIN, A. S., 1934, Common Ostracoda of the Traverse group: Univ. Michigan Mus. Paleontology Contrib., vol. 4, pp. 205–225.

——, 1937, Type invertebrate fossils of North America (Devonian): Ostracoda. Philadelphia, Wagner Free Inst. of Sci.

——, 1945, Ostracoda. Philadelphia, Wagner Free Inst. Sci.

WELLS, JOHN W., 1944, Middle Devonian Bone beds of Ohio: Geol. Soc. America Bull., vol. 55, pp. 273–302.

WESTGATE, L. G., and FISCHER, R. P., 1933, Bone beds and crinoidal sands of the Delaware limestone of central Ohio: Geol. Soc. America Bull., vol. 44, pp. 1161–1172.

JOURNAL OF PALEONTOLOGY, VOL. 24, NO. 6, PP. 667–672, PL. 87, NOVEMBER 1950

CONODONTS FROM THE CEDAR VALLEY LIMESTONE OF IOWA

H. R. DOWNS AND WALTER YOUNGQUIST
State University of Iowa and University of Idaho

ABSTRACT—A sparse conodont assemblage has been collected from thin shale partings in the lower portion of the Rapid member of the Cedar Valley limestone in southeastern Iowa. Four genera, *Hindeodella*, *Icriodus*, *Ozarkodina*, and *Polygnathus* are represented, and the better specimens of these are described and illustrated. The general aspect of the assemblage is compatible with a Middle Devonian assignment of these beds.

INTRODUCTION

THE name "Cedar Valley" was proposed by McGee (1891, p. 319) for the "series of calcareous Devonian sediments stretching from the Minnesota line to Muscatine County," Iowa. In 1912, Keyes subdivided these beds, in ascending order, into the Solon, Rapid, Coralville, and Lucas members. Since then, various revisions have been proposed and some new names introduced, but chiefly because of priority, these later terms have been abandoned in favor of the ones originally used, with the exception that the term "Coralville" has been extended to include the two uppermost units of Keyes. That is, the Cedar Valley limestone is now generally considered to consist of three members; from oldest to youngest these are the Solon, Rapid, and Coralville.

The thickness of the Cedar Valley limestone in the area under consideration (Johnson County, Iowa) is somewhat over 100 feet. The Solon, Rapid, and Coralville members are approximately 20, 50, and 40 feet thick, respectively. Dense limestones, partly massive and partly thin-bedded, make up the bulk of the formation. Some zones are locally brecciated; other portions are lithographic, and some parts are dolomitic. Shale is a minor constituent of the formation, but in the lower portion discontinuous shale partings are moderately common.

Shale samples from the Cedar Valley limestone at a single locality have yielded a limited number of conodonts, and they form the basis of this report. The locality is at a road-cut along the north side of State Highway 382 just east of the Iowa River in the SW¼ sec. 33, T. 81 N., R. 6 W., Johnson County, Iowa.

In addition, in 1948 Youngquist listed two conodonts secured from the Cedar Valley limestone in the west end of a quarry located 200 yards south of State Highway 382 about 1 mile west of Solon, near the north line of sec. 26, T. 81 N., R. 6 W. These two specimens are appended to the faunal list of the present report.

Dr. M. A. Stainbrook has informed us by letter that both of these localities expose chiefly the lower portions of the Rapid, and that our conodonts came from that member. No conodonts are now known from the other members of the formation in this area, although they have been sampled at a number of places.

Although Upper Devonian conodonts have been studied considerably, relatively few reports have been published on Middle Devonian conodont faunas. However, in 1940 Stauffer described and illustrated a group of these microfossils from southern Minnesota, which were in part from the Cedar Valley limestone. Some of Stauffer's specimens came from "Cretaceous" clay which in places in Minnesota directly overlies the Cedar Valley limestone. A mixed fauna of both Orodovician and Devonian forms seems to be represented in this clay. In 1943, in a report on the Fortune forma-

tion of southwestern Missouri, Grohskopf, Clark, and Ellison included a study of the associated conodonts, No regional correlation of the formation was made, but the conodont fauna suggests that the age of the beds is Middle or Upper Devonian. Only a few other scattered references to Middle Devonian or possible Middle Devonian conodonts have appeared. Branson and Mehl (1938) pointed out the occurrence of representatives of *Icriodus* in some of the Middle Devonian formations of Missouri, Indiana, Ohio and Michigan, and they illustrated a few specimens from some of these formations. Grabau (1899, pp. 151, 154) called attention to the presence of conodonts in the Moscow shale (upper Hamilton) of western New York. At the present time Mr. Raymond R. Hibbard of Buffalo, New York is engaged in assembling an extensive collection of conodonts from the Moscow shale but none have so far been described.

The age of the Cedar Valley limestone was interpreted as Devonian in Owen's early description of 1852. At that time these beds were believed to be correlatives of the Hamilton, Corniferous, and Onondaga limestones of New York. Later, other authors, including Weller (1909), and Savage (1925) considered the formation to be Upper Devonian in age. A similar viewpoint was expressed by Stainbrook in 1935. More recently a Middle Devonian (upper Erian) assignment has been ascribed to the Cedar Valley limestone by Cooper et al. (1942). This latter determination is based almost exclusively on faunal comparisons.

The fauna of the present report consists of the following forms:

Hindeodella sp. (fragmental specimens not figured or described)
Icriodus alternatus Branson and Mehl
I. expansus Branson and Mehl
I. nodosus (Huddle)
Ozarkodina sp.
Polygnathus decorosa Stauffer
P. stainbrooki Downs and Youngquist, n. sp.
P. webbi Stauffer
P. xylus Stauffer

Also, in 1948 Youngquist recorded the occurrence of *Hindeodella* sp. and *Icriodus postiflexus* Branson and Mehl in the Cedar Valley limestone a few miles east of the locality of the present collection. To date, these are all of the conodonts known from the Cedar Valley limestone in its type region in east-central Iowa.

This assemblage is small, but from the specimens that are available and their general aspect in regard to their position in the scale of the evolution of the conodonts, they seem to fit best in the late Middle Devonian. In their 1938 study of *Icriodus*, Branson and Mehl stated that *I. postiflexus* "has been found only in the Silica shale . . . ," a Middle Devonian formation. However, all of the genera in the present assemblage are well known and widespread in Upper Devonian rocks, but in the Upper Devonian they take on a greater variety of form, and, in addition, are associated with such other genera as *Ancyroides* and *Palmatolepis*. Both of these genera are absent in the collection at hand, and neither seems to have been present in the conodont fauna described by Stauffer from the Cedar Valley limestone in Minnesota. There are no conodont genera in our present fauna which are definitely known to be limited to the Middle Devonian.

EXPLANATION OF PLATE 87

All specimens are from the Rapid member of the Cedar Valley limestone at a single locality about 10 miles north of Iowa City, Iowa. All figures ×40.

FIGS. *1, 2*—*Ozarkodina* sp. Outer lateral views of two specimens. (p. 670)

3, 4, 23–26—*Polygnathus decorosa* Stauffer. Three specimens are represented by *3* and *4*, *23* and *24*, *25* and *26*, respectively. (p. 670)

5–7, 13, 14—*Icriodus expansus* Branson and Mehl. *5*, Oral view of one specimen; *6, 7*, oral and lateral views, respectively, of another specimen; *13, 14* represent one specimen. (p. 669)

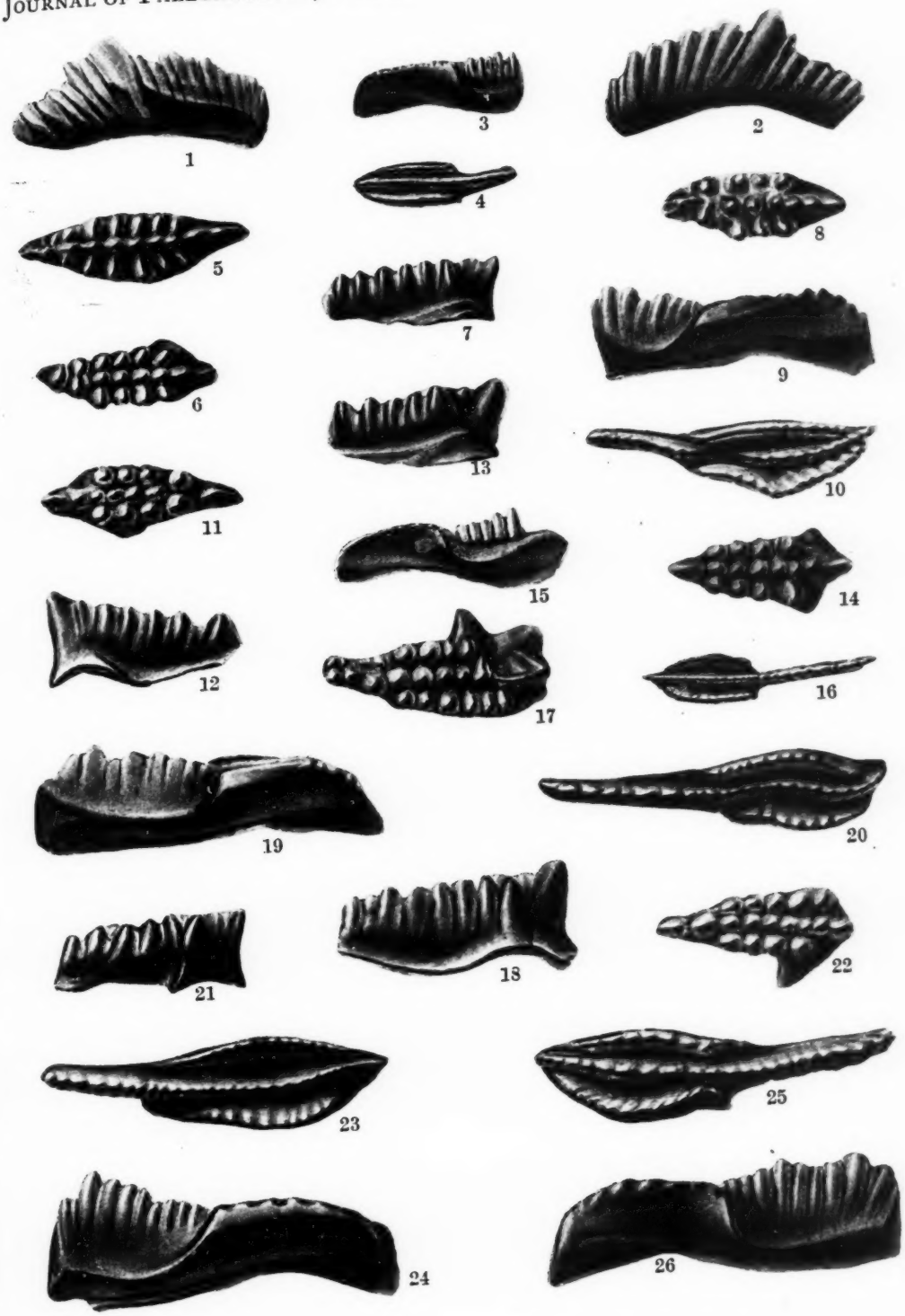
8, 11, 12—*Icriodus alternatus* Branson and Mehl. Figures *11* and *12* represent one specimen. (p. 669)

9, 10—*Polygnathus webbi* Stauffer. One specimen. (p. 671)

15, 16—*Polygnathus xylus* Stauffer. One specimen. (p. 671)

17, 18, 21, 22—*Icriodus nodosus* (Huddle). Figures *17* and *18* illustrate one specimen; *21* and *22* another specimen. (p. 670)

19, 20—*Polygnathus stainbrooki* Downs and Youngquist, n. sp. Two views of the holotype. (p. 671)



Downs and Youngquist, Cedar Valley conodonts

Nevertheless, the general aspect of the assemblage, insofar as we have been able to ascertain it, is Erian. At present, lack of adequate comparative conodont material from other formations of this general age preclude any precise correlations.

Dr. M. A. Stainbrook kindly advised us in regard to certain of the details of the stratigraphy of the Cedar Valley limestone in the area where our conodonts were secured. Professor A. K. Miller generously contributed editorial advice and suggestions to this report, and Mr. Howard Webster of Iowa City retouched the accompanying photographs. The study was prepared with the aid of the research facilities of the Geology Department of the State University of Iowa, and of the University of Idaho.

SYSTEMATIC PALEONTOLOGY

ICRIODUS ALTERNATUS Branson and Mehl

Plate 87, figures 8, 11, 12

Icriodus alternatus BRANSON and MEHL, 1934 [1933], Missouri Univ. Studies, vol. 8, no. 3, pp. 225–226, pl. 13, figs. 4–6; —— and ——, 1938, Jour. Paleontology, vol. 12, pp. 156, 158, 161, pl. 26, figs. 4–6; GROHSKOPF, CLARK, and ELLISON, 1943, Missouri Geol. Survey and Water Res. 62nd Bien. Rept., append. 4, p. 15, pl. 2, figs. 3, 6; BRANSON and MEHL, *in* Shimer and Shrock, 1944, Index fossils of North America, p. 245; MEHL and QUIGLEY, and QUIGLEY, respectively *in* Branson, 1944, Missouri Univ. Studies, vol. 19, no. 3, pp. 153, 158, pl. 26, figs. 1–5; CLARK, *in* Branson, 1944, Missouri Univ. Studies, vol. 19, no. 3, p. 155; BRANSON and MEHL, *in* Branson, 1944, Missouri Univ. Studies, vol. 19, no. 3, pp. 157, 163, pl. 28, figs. 11–13; YOUNGQUIST and PETERSON, 1947, Jour. Paleontology, vol. 21, p. 246, pl. 37, figs. 18, 19, 21.

At least two of the specimens of *Icriodus* in our collections exhibit a median row of denticles in which the denticles are not aligned transversely with the lateral rows. Aborally the excavation is relatively narrow except in the posterior third where it is only moderately flared laterally.

Occurrence.—Rapid member, Cedar Valley limestone, Johnson Co., Iowa. Also reported from the Sheffield formation of the same State; the Grassy Creek shale, the Snyder Creek shale and the Fortune formation of Missouri, and the Sylamore sandstone of Missouri and Arkansas.

Figured specimens.—State Univ. Iowa, 4172 (fig. 8), 4173 (figs. 11, 12).

ICRIODUS EXPANSUS Branson and Mehl

Plate 87, figures 5–7, 13, 14

Icriodus expansus BRANSON and MEHL, 1938, Jour. Paleontology, vol. 12, pp. 156, 158, 160–161, pl. 26, figs. 18–21; STAUFFER, 1938, idem., vol. 12, pp. 412, 430, pl. 52, figs. 12, 14, 16, 19, 20, 25, 33, 35; ——, 1940, idem., vol. 14, p. 425, pl. 60, figs. 40, 47, 48, 59–64, 70, 71; —— and THIEL, 1941, p. 229; GROHSKOPF, CLARK, and ELLISON, 1943, Missouri Geol. Survey and Water Res. 62nd Bien. Rept., append. 4, pp. 15–16, pl. 2, figs. 1, 2, 5, 8, 11, 13; BRANSON and MEHL, *in* Shimer and Shrock, 1944, Index fossils of North America, p. 245, pl. 94, fig. 63; MEHL and QUIGLEY, and QUIGLEY, respectively, *in* Branson, 1944, Missouri Univ. Studies, vol. 19, no. 3, pp. 153, 158, pl. 26, figs. 7–9, 13, 14; CLARK, *in* Branson, 1944, Missouri Univ. Studies, vol. 19, no. 3, p. 155; YOUNGQUIST and PETERSON, 1947, Jour. Paleontology, vol. 21, pp. 246–247, pl. 37, figs. 5–7, 10, 20.

This species is a rather generalized type of icriodid and as such has been given broad interpretation. The denticles are in three rows, and are usually distinct with the possible exception of the anterior-most two or three of the median row which may tend to be fused to form a crenulate ridge-like process. All of our figured specimens except that illustrated by figure 5 flare laterally along the anterior aboral margin. This specimen does not appear to do so, for that portion of the conodont has been broken away, but in other details it is similar to one of the syntypes, figure 18 of Branson and Mehl's plate 26, of 1938.

Occurrence.—Rapid member, Cedar Valley limestone, Johnson Co., Iowa. Also recorded from the Sheffield formation of the same State; the Mineola limestone, the Fortune formation, the Snyder Creek shale and the Sylamore sandstone of Missouri; the Genundewa limestone of New York, the Silica and Olentangy shales of Ohio, the "Olentangy" shale (probably Arkona beds) of Ontario, the New Albany shale of Indiana, the Alpena limestone and Ferron Point formation of Michigan, and the clay above the Cedar Valley limestone in southern Minnesota.

Figured specimens.—State Univ. Iowa, 4174 (fig. 5), 4175 (figs. 6, 7), 4176 (figs. 13, 14).

ICRIODUS NODOSUS
(Huddle)
Plate 87, figures 17, 18, 21, 22

Gondolella? nodosa HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, no. 72, pp. 16, 94, pl. 8, figs. 24, 25.

Icriodus nodosus BRANSON and MEHL, 1938, Jour. Paleontology, vol. 12, pp. 156, 158, 159, 160, 163, pl. 26, figs. 14–17, 22; MEHL and QUIGLEY, and QUIGLEY, respectively, *in* Branson, 1944, Missouri Univ. Studies, vol. 19, no. 3, pp. 153, 158, pl. 26, fig. 6.

Icriodus expansus is perhaps the most abundant species of this genus in our collection. *I. nodosus* is closely related to *I. expansus*, and Branson and Mehl in their 1938 study of the genus pointed out that the "main feature" which distinguishes these species is that the former in the "posterior third or more of the aboral outline is nearly semicircular but has an abrupt offset on the inner side." This feature is well shown by Branson and Mehl's figure 15 of 1938. At least two of our specimens appear to have a comparable aboral outline and also have particularly prominent nodes on the oral surface.

Occurrence.—Rapid member, Cedar Valley limestone, Johnson Co., Iowa. Also reported from the Grassy Creek shale of Missouri, the lower New Albany shale of Indiana, and the Genundewa limestone of New York.

Figured specimens.—State Univ. Iowa, 4177 (figs. 17, 18), 4178 (figs. 21, 22).

OZARKODINA sp.
Plate 87, figures 1, 2

Blade thin, composed of about nine to 12 denticles anteriorly and about seven posteriorly. Cusp prominent; denticles somewhat unequal in size. Aboral margin of blade sharpened except in region below cusp where it is very slightly flared laterally to encompass a small escutcheon. No traces of lateral ridges present on either side of blade.

Because of the uncertainty of the nature of the genus *Ctenognathus* Pander, it seems best to refer these specimens to *Ozarkodina* Branson and Mehl (1933), established for such blade-like forms. No trace of a flange-like expansion on both sides of the base characterizing *Bryantodus* is present on our specimens. Although it is many times difficult to effectively delimit representatives of *Ozarkodina* from those of *Bryantodus*, our present Cedar Valley specimens appear to fall within the concept of the former genus. They may represent a new species but so many of the denticles as well as the cusp are incomplete distally as to make either specimen unsatisfactory as a holotype.

Occurrence.—Rapid member, Cedar Valley limestone, Johnson Co., Iowa.

Figured specimens.—State Univ. Iowa, 4179 (fig. 1), 4180 (fig. 2).

POLYGNATHUS DECOROSA Stauffer
Plate 87, figures 3, 4, 23–26

Polygnathus decorosus STAUFFER, 1938, Jour. Paleontology, vol. 12, pp. 413, 438, pl. 53, figs. 1, 5, 6, 10, 11, 15, 16, 20, 30; YOUNGQUIST, 1947, idem., vol. 21, p. 109, pl. 24, fig. 21; —— and PETERSON, 1947, idem., vol. 21, p. 250, pl. 36, figs. 10–12; MILLER and YOUNGQUIST, 1947, idem., vol. 21, pp. 514–515, pl. 74, figs. 6, 7.

This rather generalized species of *Polygnathus* is represented in our collection by several specimens, three of which are illustrated. In oral view, the long axis of the specimen is moderately bowed; the platform is about equal to, or slightly longer than the blade. The blade is strongly compressed, is sharpened aborally, and contains some ten or 12 denticles which are confluent essentially to their apices. The largest denticle of the blade is not terminal; that is, it is succeeded anteriorly by two or three smaller denticles. The escutcheon is small and is located on the anterior third of the platform. Our figures 3 and 4 represent a small individual which is incomplete anteriorly.

Occurrence.—Rapid member, Cedar Valley limestone, Johnson Co., Iowa. Also reported from the Olentangy shale of Ohio, the "Olentangy" shale (probably Arkona beds) of Ontario, the Sheffield and Sweetland Creek formations in Iowa and an unnamed Upper Devonian shale in the same state.

Figured specimens.—State Univ. Iowa, 4181 (figs. 3, 4), 4182 (figs 23, 24), 4183 (figs. 25, 26).

POLYGNATHUS STAINBROOKI Downs and Youngquist, n. sp.
Plate 87, figures 19, 20

Platform and blade stout, subequal in length. About eight laterally compressed short denticles compose the blade. The aboral margin of the blade is sharpened to a keel-like form but the bulk of the blade is thick. Posteriorly, the trend of the blade continues across the platform as a stout, sinuous carina. The posterior portion of the platform is recurved aborad as well as laterally and the carina persists to the extreme tip of this aborad portion. Inner oral margin of platform convex inward; outer margin convex outward in posterior portion but somewhat recurved anteriorly. Inner sides of platform margins on oral side very steeply inclined; inner side slightly higher than outer side. Aborally, the platform bears a stout keel both posteriorly and anteriorly of the small escutcheon which is located slightly anterior of midlength on the platform.

This species can be distinguished from the species of *Polygnathus* of comparable size in the collections from the Cedar Valley limestone of Minnesota in that the oral marginal portions of the platform are high in our Iowa form, and are steeply inclined whereas the Minnesota specimens tend to have a broad, relatively shallow platform orally. The sinuous character of the carina of *P. stainbrooki* is also distinctive. The species is named in honor of Dr. M. A. Stainbrook, outstanding student of the Devonian of Iowa.

Occurrence.—Rapid member, Cedar Valley limestone, Johnson Co., Iowa.

Holotype.—State Univ. Iowa, 4184.

POLYGNATHUS WEBBI Stauffer
Plate 87, figures 9, 10

Polygnathus webbi STAUFFER, 1938, Jour. Paleontology, vol. 12, pp. 413, 439, pl. 53, figs. 25, 26, 28, 29; MILLER and YOUNGQUIST, 1947, idem., vol. 21, p. 515, pl. 74, figs. 1, 2.

Entire specimen only gently arched and moderately bowed. In oral view the outer half of the platform is flared laterally about at midlength and slightly posteriad. Carina and transverse platform ornamentation prominent.

This species can perhaps best be identified from an oral view and the types as well as those from the Sweetland Creek shale and the present specimen all exhibit the lateral flaring of the outer margin of the platform. Anterior portion of blade not preserved on figured individual.

Occurrence.—Rapid member, Cedar Valley limestone, Johnson Co., Iowa. Also occurs in the Sweetland Creek shale of Iowa and the Olentangy shale of Ohio.

Figured specimen.—State Univ. Iowa, 4185.

POLYGNATHUS XYLUS Stauffer
Plate 87, figures 15, 16

Polygnathus xylus STAUFFER, 1940, Jour. Paleontology, vol. 14, pp. 430–431, pl. 60, figs. 42, 50, 54, 65–67, 69, 72–74, 78, 79; —— and THIEL, 1941, Minnesota Geol. Survey Bull. 29, p. 229.

This species appears to have been abundantly represented in the collections described by Stauffer from the Cedar Valley limestone and associated clays in Minnesota. We have several specimens also, the best of which is illustrated. It is, like *P. decorosa*, a rather typical specimen of *Polygnathus*, but may be distinguished from the latter form by the fact that the blade is longer than the platform (see fig. 16), whereas in *P. decorosa* the platform is usually the longer and relatively larger. Also, the carina of that species is more nodose and not a "nearly smooth ridge" as in this one. The original description of *P. xylus* states that the blade consists of "about 20 laterally compressed denticles" and the "denticles forming the median ridge of the plate may coalesce into a nearly smooth ridge. . . ." Presumably the blade proper, therefore, had appreciably less than 20 denticles and the illustrations bear this out and agree with our specimens in having about eight to ten denticles in the blade proper.

Occurrence.—Rapid member, Cedar Valley limestone, Johnson Co., Iowa, and the same formation and associated clays in southern Minnesota.

Figured specimen.—State Univ. Iowa, 4186.

REFERENCES

BRANSON, E. B., 1944, The geology of Missouri: Missouri Univ. Studies, vol. 19, no. 3, pp. 1–535, pls. 1–49.

——, and MEHL, M. G., 1933, Conodont studies number 1: Missouri Univ. Studies, vol. 8, no. 1, pp. 1–72, pls. 1–4.

——, and ——, 1934 [1933], Conodonts from the Grassy Creek shale of Missouri: Missouri Univ. Studies, vol. 8, no. 3, pp. 171–259.

——, and ——, 1938, The conodont genus *Icriodus* and its stratigraphic distribution: Jour. Paleontology, vol. 12, pp. 155–166, pl. 26.

——, and ——, 1944, *in* Shimer and Shrock, Index fossils of North America. New York, John Wiley and Sons, pp. 235–246, pls. 93, 94.

COOPER, G. A., et al., 1942, Correlation of the Devonian sedimentary formations of North America: Geol. Soc. America Bull. 53, pp. 1729–1794.

GRABAU, A. W., 1899, The palaeontology of Eighteen Mile Creek and the lake shore sections of Erie County, New York: Buffalo Soc. Nat. Sci. Bull., vol. 6, pp. 93–318.

GROHSKOPF, J. G., CLARK, E. L., and ELLISON, S., 1943, The Fortune, a new Devonian formation in southwestern Missouri: Missouri Geol. Survey and Water Res. 62nd Bien. Rept., appendix 4, pp. 1–17.

HUDDLE, J. W., 1934, Conodonts from the New Albany shale of Indiana: Bull. Am. Paleontology, vol. 21, no. 72, pp. 1–139, pls. 1–12.

KEYES, C. R., 1912, Sundry provincial and local phases of the general geologic section of Iowa (abstract): Iowa Acad. Sci. Proc., vol. 19, pp. 147–151.

MCGEE, W. J., 1891, The Pleistocene history of northeastern Iowa: U. S. Geol. Survey Ann. Rept. 11, pt. 1, pp. 189–537.

MILLER, A. K., and YOUNGQUIST, WALTER, 1947, Conodonts from the type section of the Sweetland Creek shale in Iowa: Jour. Paleontology, vol. 21, pp. 501–517, pls. 72–75.

OWEN, D. D., 1852, Report of a geological survey of Wisconsin, Iowa, and Minnesota; and incidentally of a portion of Nebraska territory. Philadelphia.

SAVAGE, T. E., 1925, Comparison of the Devonian rocks of Illinois and Missouri: Jour. Geology, vol. 33, pp. 550–558.

STAINBROOK, M. A., 1935, Stratigraphy of the Devonian system of the upper Mississippi Valley: Kansas Geol. Soc. Guidebook, 9th Ann. Field Conf., pp. 248–260.

STAUFFER, C. R., 1938, Conodonts of the Olentangy shale: Jour. Paleontology, vol. 12, pp. 411–443, pls. 48–53.

——, 1940, Conodonts from the Devonian and associated clays of Minnesota: Jour. Paleontology, vol. 14, pp. 417–435, pls. 58–60.

——, and THIEL, G. A., 1941, The Paleozoic and related rocks of southeastern Minnesota: Minnesota Geol. Survey Bull. 29, pp. 3–261.

WELLER, STUART, 1909, Correlation of the Middle and Upper Devonian and the Mississippian faunas of North America: Jour. Geology, vol. 17, pp. 257–285.

YOUNGQUIST, WALTER, 1947, A new Upper Devonian conodont fauna from Iowa: Jour. Paleontology, vol. 21, pp. 95–112.

——, 1948 [1947], Notes on the occurrence of conodonts in Iowa: Iowa Acad. Science Proc., vol. 54, pp. 199–205.

——, and PETERSON, R. F., 1947, Conodonts from the Sheffield formation of north-central Iowa: Jour. Paleontology, vol. 21, pp. 242–253.

2

1

Miller and Collinson, Mississippian nautiloid

JOURNAL OF PALEONTOLOGY, VOL. 24, NO. 6, PP. 673–674, PL. 88, 1 TEXT FIG., NOVEMBER 1950

A UNIQUE MISSISSIPPIAN NAUTILOID FROM KENTUCKY

A. K. MILLER AND CHARLES COLLINSON
State University of Iowa, Iowa City, Iowa

ABSTRACT—A large nodose discoidal nautiloid from the Meramec of south-central Kentucky is illustrated and described as *Tylodiscoceras unicum*, n. gen. and n. sp.

IN 1946, while Mr. Prentice Lawrence was tilling his tobacco field in south-central Kentucky, his plow "hung" on a hard object and broke when the mules lunged forward. The cause of the difficulty, when unearthed, proved to be a large silicified coiled cephalopod which two years later the finder gave to his cousin, Mr. Z. B. Lawrence of nearby Adairville, Kentucky. The latter Mr. Lawrence showed the specimen to Dr. W. F. Castellon of his home town, who took it to Vanderbilt University. From there it was sent to us for study by Professor Charles W. Wilson, Jr., with the kind permission of Professor Willard B. Jewell.

This specimen does not seem to be at all close to any of the comparatively few nautiloids that are known from the Mississippian strata of North America. Nor is it even congeneric with any of the numerous forms that have been described from the Lower Carboniferous of Europe, especially by de Koninck and Foord. Although it has low, broad whorls and large, prominent lateral nodes which are somewhat reminiscent of *Endolobus*, it is discoidal in shape and possesses a broad concave ventral zone, which suggests a probable relationship to *Discitoceras*. In the latter genus, the lateral zones of the conch bear prominent longitudinal ribs but not nodes.

After very careful consideration, we have decided to propose both a generic and a specific name for this form. The former is given to suggest the nodose discoidal character of the conch, and the latter the uniqueness of both the species and the specimen.

TYLODISCOCERAS M. & C., n. gen.

Genotype.—Tylodiscoceras unicum M. & C., n. sp.

Conch large, discoidal, and nautiliconic but only very slightly involute. Whorls depressed, rounded laterally, and concave ventrally. Umbilicus large, open, and probably perforate; umbilical shoulders rounded and indefinite. Test thick and bears a single row of large rounded lateral nodes on each side of conch. Sutures form shallow broadly rounded ventral, lateral, and presumably dorsal lobes, separated by narrowly rounded ventrolateral and dorsolateral saddles.

TYLODISCOCERAS UNICUM
M. & C., n. sp.
Plate 88, figures 1, 2

This species is based on a single specimen which, though not complete adorally, has a maximum over-all diameter of about 29 cm. All but the adoral quarter-volution of it is

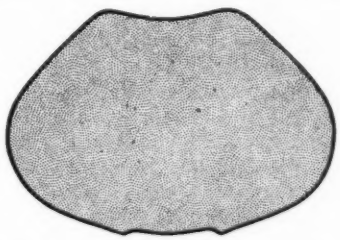


FIG. 1—*Tylodiscoceras unicum* M. & C., n. sp. Outline cross section of conch, between nodes near adapical end of outer volution of holotype, ×½.

EXPLANATION OF PLATE 88

FIGS. 1, 2—*Tylodiscoceras unicum* M. & C., n. sp. Two views of the holotype, from the Meramec about 9 miles west of Adairville, Kentucky, ×½. (p. 673)

septate and presumably, therefore, represents phragmacone.

The conch is discoidal in shape and is nautiliconic in its mode of growth, though it is very slightly impressed dorsally. The whorls are subelliptical in cross section as they are considerably wider than high, are rounded laterally, and concave ventrally. Near the junction of the phragmacone and the living chamber, where the diameter of the specimen measures about 26 cm., the conch is about 83 mm. high and 125 mm. wide (not including the nodes) and the width and depth of the ventral concave zone are about 66 mm. and 5 mm., respectively. The borders of this zone are fairly distinct as they are almost angular, particularly on the internal mold.

The umbilicus is large and open, and its diameter is equal to about three-fifths that of the specimen. The umbilical shoulders are rounded and indefinite. Although the extreme adapical portion of the holotype is not preserved, its general physiognomy suggests that the umbilicus is perforate.

The test is thick, and near the junction of the phragmacone and the living chamber of the holotype, its thickness measures about 5 mm. near the venter. It is slightly thickened ventrolaterally and markedly so laterally. On both of the lateral zones there is a single row of large prominent rounded nodes, of which there are about 13 to the volution. These nodes are very much more prominent on the exterior of the test than on the internal mold. On the adapical portion of the holotype, the nodes are longitudinally elongate and are more nearly confluent than on the fully mature part of the same specimen—this fact suggests that they evolved from a longitudinal rib or ridge. On at least the mature portion of the conch, there are very low inconspicuous rounded dorsolateral nodes which alternate in position with the obvious lateral ones. The surface of the test of the holotype also bears traces of numerous fine growth lines which, at least on the umbilical walls and the lateral zones of the conch, are directly transverse though slightly sinuous.

The camerae are moderate in length, and there are about six of them in the adapical quarter of the outer volution of the holotype. However, the adoral camerae of this specimen are relatively short—the ventral length of the last one is only some 13 mm. and that of the preceding one about 20 mm. The shortness of these adoral camerae suggests that we are dealing with a late mature individual. Each external suture forms a broad shallow rounded ventral lobe and on either side of it a very narrowly rounded low ventrolateral saddle which centers on the ventrolateral ridge, a shallow rounded asymmetrical lateral lobe, and a low relatively narrowly rounded lateral saddle which centers near the umbilical shoulder. The nature of the internal sutures and the siphuncle cannot be ascertained from the holotype.

Remarks.—The specimen just described is, for the most part, preserved in chert, but at least part of its penultimate volution consists of chalcedony. In view of the fact that it is not even congeneric with any other known form, specific comparisons would be superfluous.

Occurrence.—About 9 miles west of Adairville, Logan County, Kentucky (approximately 4 miles from the Kentucky-Tennessee line). According to Dr. Charles W. Wilson, Jr., it was found in residual "soil from the Warsaw and St. Louis of the Highland Rim," but it could of course "have been let down vertically" or artificially transferred laterally. Its general nature is, however, quite in keeping with a Meramecian age.

Repository.—Vanderbilt University.

JOURNAL OF PALEONTOLOGY, VOL. 24, NO. 6, PP. 675–692, PLS. 89–90, 4 TEXT FIGS., NOVEMBER 1950

A NEW FORAMINIFERAL FAUNA FROM THE ESNA SHALES AND UPPER CRETACEOUS CHALK OF EGYPT

S. E. NAKKADY
Farouk I University, Alexandria, Egypt

ABSTRACT—The Esna shales are a series of strata that lie at the base of the lower Eocene in Egypt. They contain almost no macrofossils, but the careful study of five widely separated stratigraphic sections has revealed a large microfauna. This, together with Foraminifera from the underlying Cretaceous Chalk and overlying Eocene beds, constitutes a fauna of 168 species and varieties which is listed. Nineteen new species and 17 new varieties are described in this report. Analyses of the relations and ranges of these forms furnish new information on the Mesozoic-Cenozoic boundary in this region.

INTRODUCTION

THE Esna shales are a series of beds lying below the earliest generally recognized Eocene formations of Egypt. The true stratigraphic position of these beds and the position of the Mesozoic-Cenozoic boundary have long been a matter of dispute among geologists.

The author has examined a large number of samples collected from the Esna shales and Upper Cretaceous Chalk at five widely separated sections in Egypt and has found them to contain a rich and very interesting foraminiferal fauna. The locations of these sections are shown on the accompanying map (fig. 1) which, together with figures 2 and 3, was prepared by Mr. R. W. Pooley of the Anglo-Egyptian Oilfields, Ltd. Figures 2, 3 and 4 show the stratigraphic columns, correlations, positions of the samples in the various areas, and the lithologic characters of the formations.

The author wishes to express his gratitude and thanks to Professor Alan Wood of the University of Wales for his invaluable help and guidance and to Mr. C. D. Ovey of the British Museum (Natural History), London, who has made available the extremely rich collection and library of the museum. Of 168 species and varieties which the writer identified, those described below are considered new. In the distribution of the forms the following words stand as equivalent to the corresponding number of specimens in 0.4 gm. of the sample:

Rare = from 2–4 specimens.
Frequent = from 5–9 specimens.
Abundant = from 10–20 specimens.
Flooding = more than 20 specimens.

Types of the new species and varieties have been deposited in the British Museum (Natural History), London.

CRETACEOUS CHALK FAUNA

The fauna of the Cretaceous Chalk consists of two parts. The first is very characteristic and includes those forms which are confined to the Chalk or continue only into the basal part of the Esna shales. The sharp change in fauna, marked by the disappearance of these Foraminifera, coincides exactly with the lithological boundary between the shales and Chalk in the Gebel Duwi section. In the Wadi Mellaha section it occurs below the lithological change. In the Abu Durba and Wadi Danili sections the faunal change comes above the lower layers of the shales. Important members of this fauna are:

Bolivinoides rhomboidea (Cushman)
Eouvigerina aegyptiaca, n. sp.
Globotruncana arca (Cushman)
Globotruncana arca var. *esnehensis*, n. var.
Globotruncana aegyptiaca, n. sp.
Globotruncana aegyptiaca var. *duwi*, n. var.
Globotruncana cretacea Cushman
Globotruncana pseudocretacea, n. sp.
Gümbelina globulosa (Ehrenberg)
Gümbelina striata (Ehrenberg)
Gümbelina striata (Ehrenberg) var. *compressa*, n. var.
Planoglobulina acervulinoides (Egger)
Neobulimina cf. *canadensis* Cushman and Wickenden
Reussella aegyptiacus, n. sp.
Siphogenerinoides oveyi, n. sp.

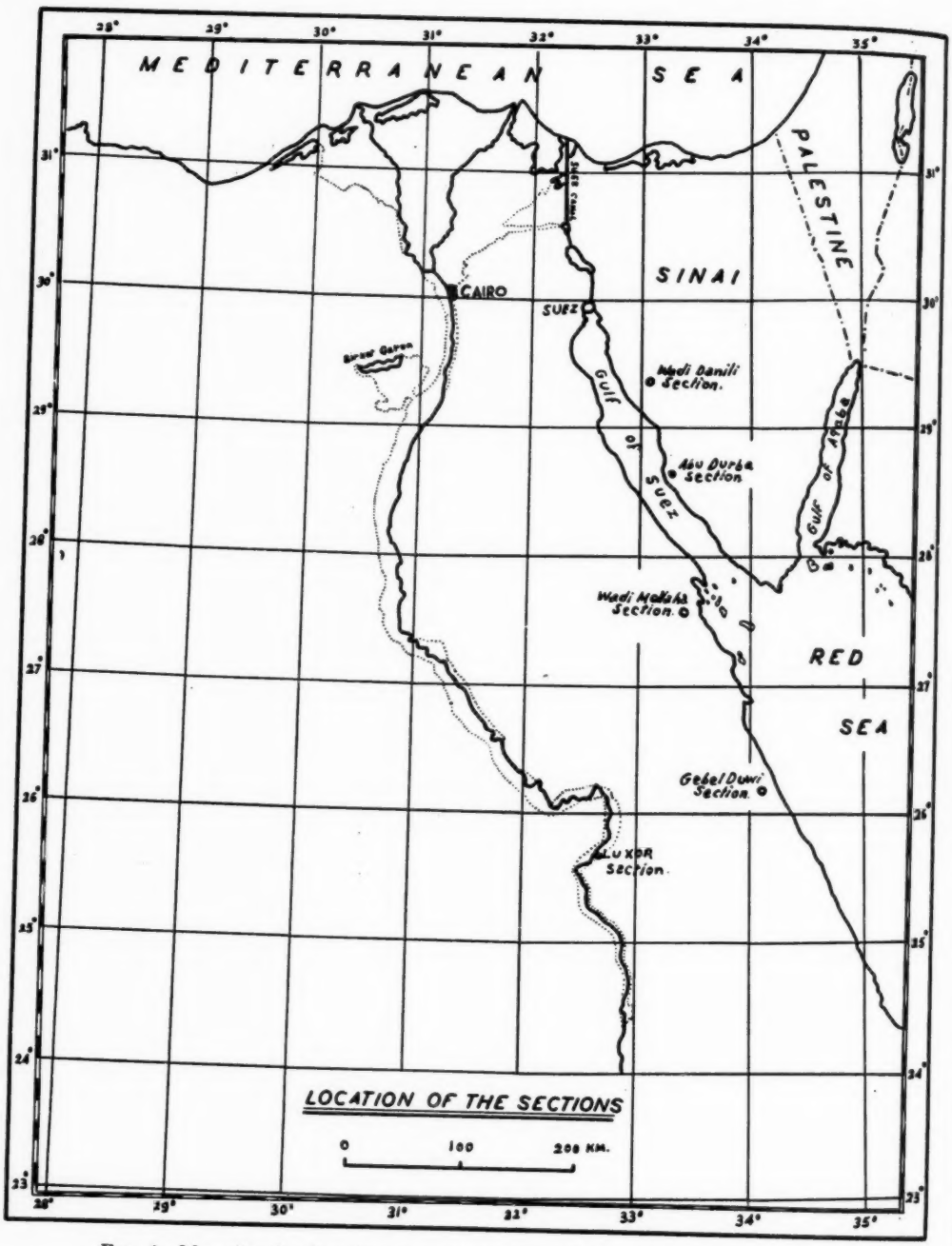


FIG. 1—Map showing locations of sections from which samples were collected.

The remaining and less important part of the Chalk fauna consists of Foraminifera which continue higher in the Esna shales and some of their ranges extend into the overlying Eocene.

ESNA SHALE FAUNA

This fauna is much richer and more varied than the one which occurs in the Cretaceous Chalk. The difference may result in part from the difficulty with which most Chalk samples are disassociated and the consequent smaller number of specimens that have been available for study.

In the Abu Durba and Wadi Danili sections the Esna shales are divisible into two zones. The lower and much thinner of these is characterized mainly by the Cretaceous Chalk fauna, but it also includes an important assemblage that is an essential constituent of the Esna fauna as a whole.

The higher zone, which is equivalent to the major part of the Esna shales, lacks the typical Chalk forms but numerous new Foraminifera appear. Some, like *Globigerina cretacea* var. *esnehensis*, n. var., continue from the upper part of the shales into the Eocene.

The main part of the fauna consists of forms which flourished particularly in the shales, but some of these made their first appearance in the Chalk and others extend into the Eocene. In this fauna the Globigerinidae and Globorotaliidae are very conspicuous, while members of the Lagenidae, Anomalinidae, Buliminidae, Rotaliidae, Verneuilinidae, etc., play a secondary part. This is a strong contrast to the Cretaceous Chalk fauna where the Heterohelicidae and the Globotruncanas are outstanding members.

Analysis of fauna

Of 168 species and varieties identified from the Esna shales:

14 are common to the Chalk, shales and Eocene
55 occur in both the Chalk and shales
8 occur in both the shales and lower Eocene of the sections studied.

The relations of the Esna fauna to the Eocene is much closer, however, than the last figure suggests, because 33 of the Esna forms are also known from the lower and middle Eocene at other localities in Egypt.

The transitional nature of the Esna fauna is clearly shown by the facts that about one-third of the forms range upward from the Cretaceous Chalk and about one-third of the remainder continue into the Eocene.

The composition of the Esna fauna is quite similar in all of the sections studied, but ranges of individual forms vary somewhat. In the Wadi Danili section the sharply keeled *Globorotaliae* and *Globigerina cretacea* var. *esnehensis* make delayed appearances. The first specimens of the former were obtained from the top sample of the shales and the latter was not noted below the Eocene. In all sections the Globigerinidae and Globorotaliidae are predominant, but the relative abundance of the Anomalinidae, Rotaliidae, Verneuilinidae, Lagenidae and Buliminidae varies considerably.

FAUNAL COMPARISONS

Cretaceous

The Senonian of Palestine contains 13 species also known from the Cretaceous Chalk of Egypt, and 18 species that occur in the Esna shales.

It is difficult to compare exactly the relative distribution of the very few but important species reported by Henson in 1938 because of uncertainty regarding correlations and the symbols of his legend. General agreement is indicated, however, by the conspicuous occurrence of *Gümbelina* and *Globotruncana* and the secondary importance of other characteristic Cretaceous genera and species, such as *Pseudotextularia*, *Bolivinoides* and *Bolivina incrassata*. Henson reported that typical *Globigerina cretacea* continues to the end of the Tertiary, but Egyptian studies show that this form is restricted to the Cretaceous although its variety *esnehensis* may have a more extended upward range.

Reuss's work on the Cretaceous of Bohemia shows the occurrence there of seven Egyptian Cretaceous Chalk species and 14 Esna shale species.

Twenty-four species from the Chalk and 43 from the shales are known also from various localities in the Gulf Coastal Upper Cretaceous of the U. S. A.

The Upper Cretaceous of the Mexican Tampico Embayment has 12 species in

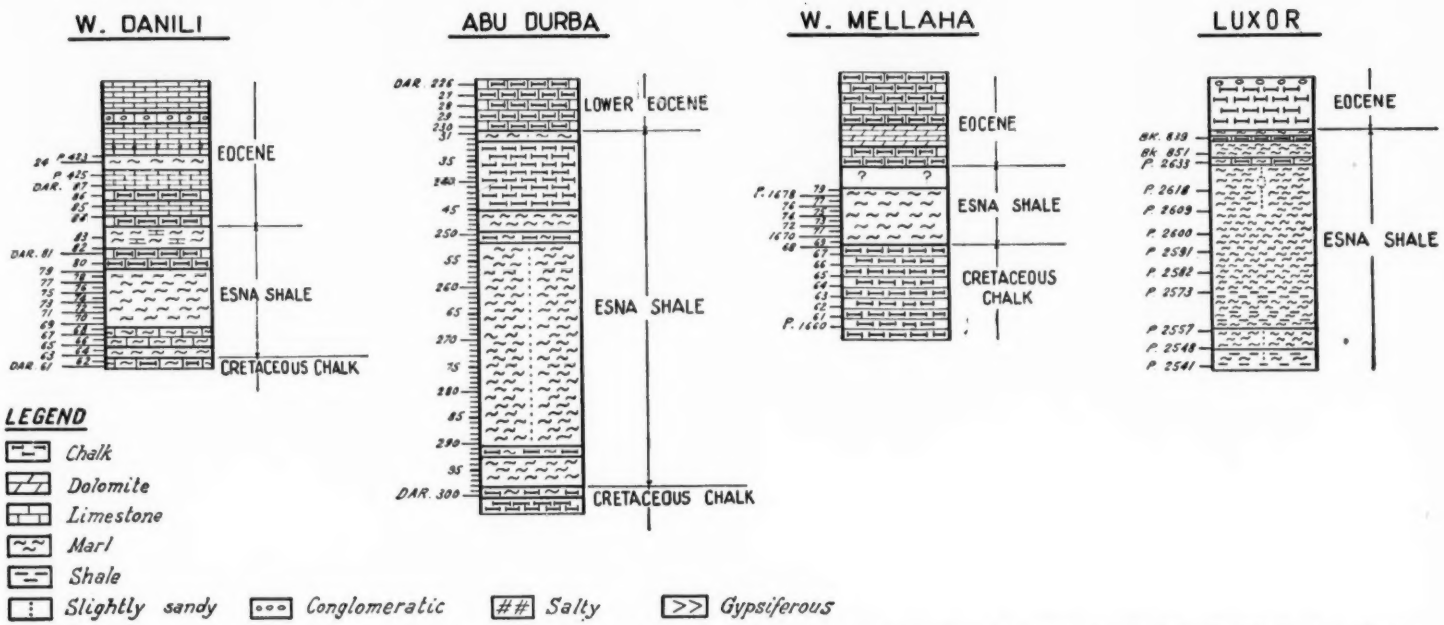


FIG. 2—Stratigraphic columns, positions of the samples and lithology in the various areas; scale 1:1000. Drafted by R. W. Pooley, 1946.

common with the Cretaceous Chalk and 17 with the shales.

D'Orbigny's and Pierre Marie's work on the Craie Blanche fauna of the Paris Basin shows the presence of 14 Esna shale species and eight Egyptian Chalk species. Although few in number these are an important part of the microfaunal assemblage.

Paleocene-Eocene

Fifteen Texas Midway species, some of them important markers for Paleocene or Eocene horizons, occur in the Esna fauna.

Twenty-six species, some of them very characteristic, are common to both the Esna shales and the Paleocene or Eocene of Alabama.

Only 17 species of the Arkansas Paleocene occur in the Esna fauna. Of these six are important Paleocene markers: *Siphogenerinoides eleganta, Loxostoma applinae, Cibicides praecursorius, Bulimina cacumenata, Ellipsonodosaria midwayensis* and *Ellipsonodosaria paleocenica.*

Six Trinidad species are also well represented in the Esna shales.

Eight species are common to the Eocene near Berlin and the Esna shales.

Collectively, the Eocene and Paleocene faunas noted above contain 35 species in common with the Esna shales. This is an important part of the entire faunal assemblage, especially as many of these species are recognized markers of the Paleocene or Eocene and are now known in other zones.

TRANSITIONAL CHARACTER OF THE ESNA SHALE FAUNA

The Esna shale fauna is transitional, with Cretaceous affinities below and Eocene affinities above. This is shown by the 62 species found in the Esna shales that were first recorded from the Upper Cretaceous and the 52 species that were first recorded from the Paleocene or Eocene. In addition, 12 species were first recorded from more recent formations.

Fifty-eight Esna species are present in typical Cretaceous faunas of Europe and America and 48 species also occur in recognized Paleocene or Eocene zones either in Egypt or elsewhere.

The transitional character of this microfauna has been confirmed by comparison with contemporaneous zones in Palestine and other neighboring countries which have very similar faunas.

MESOZOIC-CENOZOIC BOUNDARY

The exact relation between the Mesozoic and Cenozoic in Egypt can be ascertained

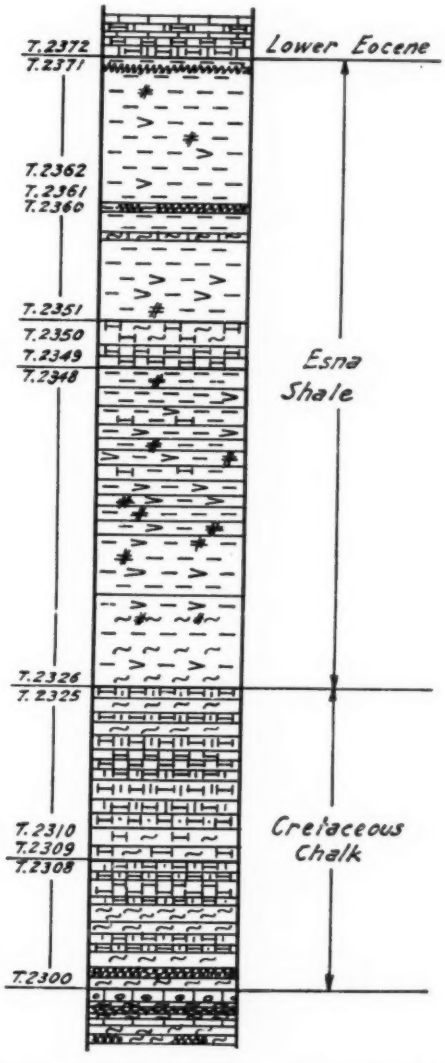


FIG. 3—Stratigraphic column, positions of the samples and lithology at Gabel Duwi; scale 1:2000. Drafted by R. W. Pooley, 1946.

only by extending work of the present type to cover many more localities. Geologists

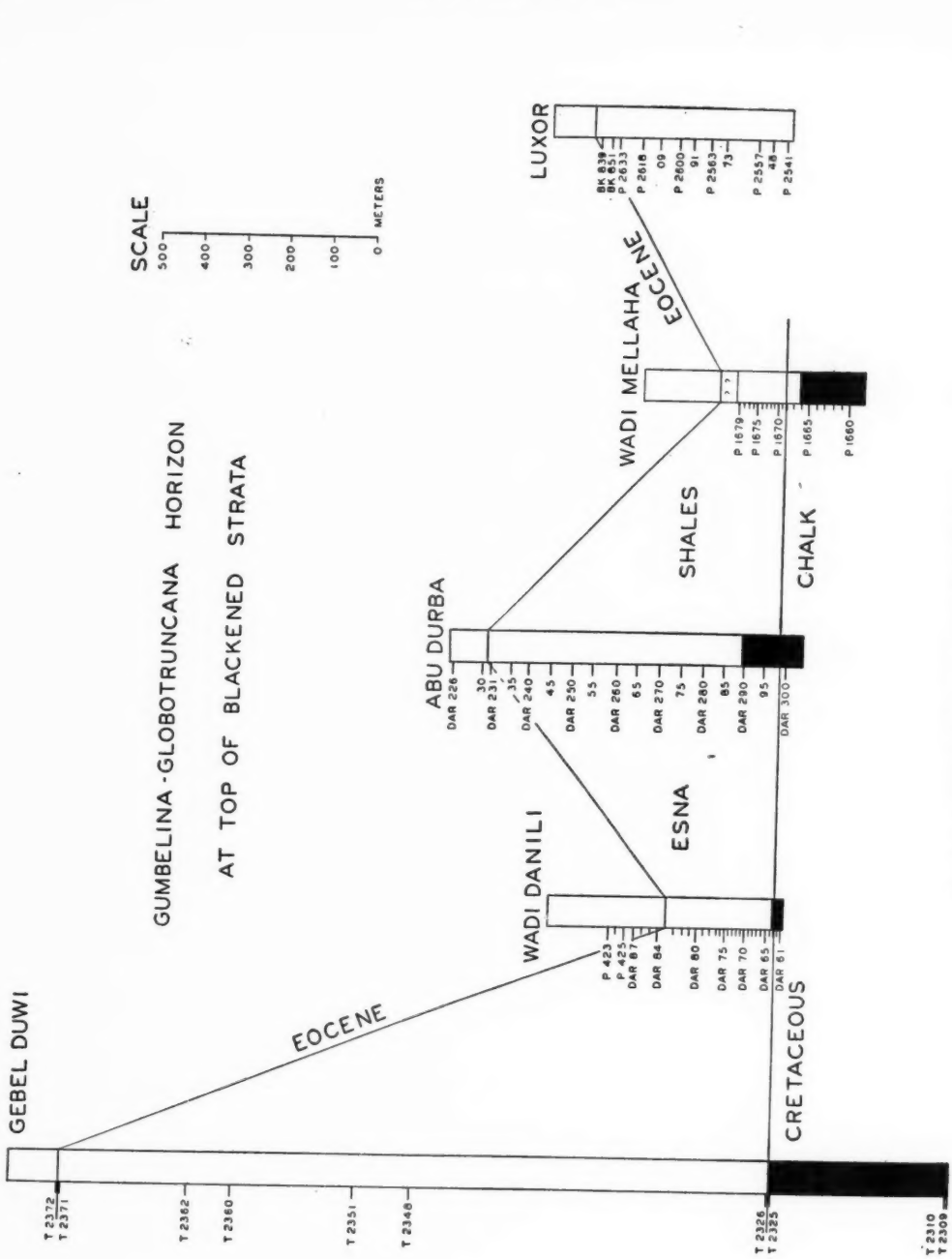


FIG. 4—Correlation of stratigraphic sections.

still are in dispute. The most recent consideration of this matter is presented in an abstract of a paper by Cuvillier in the 1948 International Geological Congress, in which the author disagrees with the conclusion of Faris in 1947 that perfect conformity exists. Cuvillier seems to abandon his former opinion that conformity occurs at the Oasis of Farafra where the classical section of El Guss Abu Said has, since Zittel's time, been regarded by all authors as clearly showing continuous deposition from the Cretaceous to the Eocene.

The results of the present foraminiferal study favor the conclusion that the strata are conformable at the localities examined. Physical evidence supports paleontological. Although at some places the lithologic boundaries of the shales are abrupt, no evidence of unconformity has been noted and elsewhere a gradual lithologic transition occurs.

IDENTIFIED FORMS

The following is a systematic list of the identified forms arranged according to Cushman's classification. Within each family the genera and species are arranged alphabetically. The only exception to this is the Lagenidae where the genera are arranged in phylogenetic order.

Saccamminidae

Psammosphaera laevigata White

Ammodiscidae

Ammodiscus incertus (d'Orbigny)

Lituolidae

Ammobaculites esnehensis, n. sp.
A. esnehensis var. *nudus*, n. var.
Haplophragmoides bradyi (Schwager)

Textulariidae

Textularia carinata d'Orbigny
T. niloticum (Schwager)
Vulvulina colei Cushman

Verneuilinidae

Clavulinoides trilatera var. *concava* Cushman
Gaudryina laevigata Franke
G. cf. *lumbricalis* Schwager
G. pyramidata Cushman
G. rugosa d'Orbigny
G. soldadoensis Cushman & Renz
G. soldadoensis var. *cavus-dulcis*, n. var.
Pseudoclavulina clavata (Cushman)
Verneuilina cretacea Karrer
V. luxorensis, n. sp.

Valvulinidae

Calvulina parisiensis d'Orbigny
Textulariella cretosa Cushman

Miliolidae

Spiroloculina bicarinata d'Orbigny
S. proboscidea Schwager

Trochamminidae

Trochammina claibornensis Howe

Lagenidae

Robulus chambersi Garrett
R. cultratus Montfort
R. isidis (Schwager)
R. mellahensis, n. sp.
R. mellahensis, var. *obesus*, n. var.
R. pseudocultratus Cole
R. pseudo-secans Cushman
R. radiifera (Schwager)
Lenticulina gussensis (Schwager)
L. mexicanus var. *alticostatus* Cushman & Barksdale
L. navicula (d'Orbigny)
L. ovalis (Reuss)
L. pseudo-mammiligera (Plummer)
L. reniformis (d'Orbigny)
L. rotulata (Lamarck)
Saracenaria triangularis (d'Orbigny)
Marginulina eggeri Brotzen
M. gussensis Schwager
M. wetherellii Jones
M. wetherellii var. *intercostata*, n. var.
M. wetherellii var. *longicostata*, n. var.
Vaginulina subulata Ehrenberg
V. taylorana Cushman
Dentalina basiplanata Cushman
D. inornata d'Orbigny
D. cf. *involvens* Cushman
D. legumen (Reuss)
D. megalopolitana Reuss
D. subcommunis d'Orbigny
Nodosaria affinis Reuss
N. conspurcata Reuss
N. latejugata Gumbel
N. longiscata d'Orbigny
N. soluta (Reuss)
N. vertebralis (Batsch)
N. zippei Reuss
Pseudoglandulina caudigera (Schwager)
P. pygmaea (Reuss)
P. simulans (Silvestri)
Palmula reticulata (Reuss)
P. rugosa (d'Orbigny)
P. cf. *suturalis* (Cushman)
P. woodi, n. sp.
P. woodi var. *undulata*, n. var.
Frondicularia esnehensis, n. sp.
F. goldfussi Reuss
F. inversa Reuss
F. lanceolata Perner
F. linearis Franke
F. wanneri, n. sp.

Polymorphinidae

Ramulina globulifera Brady

Heterohelicidae

Bolivinoides rhomboidea (Cushman)
Bolivinopsis rosula (Ehrenberg)
Eouvigerina aegyptiaca, n. sp.
Gümbelina globulosa (Ehrenberg)
G. striata (Ehrenberg)
G. striata var. *compressa*, n. var.
Planoglobulina acervulinoides (Egger)
Siphogenerinoides eleganta (Plummer)
S. oveyi, n. sp.
S. oveyi var. *compressa*, n. var.

Buliminidae

Bolivina esnehensis, n. sp.
B. incrassata Reuss
B. phyllodes (Ehrenberg)
B. woodi, n. sp.
Bulimina cacumenata Cushman & Parker
B. kickapooensis Cole
B. murchisoniana d'Orbigny
B. pahiensis Finlay
B. prolixa Cushman & Parker
B. spinata Cushman & Campbell
Buliminella carseyae Plummer
Loxostoma applinae (Plummer)
L. applinae var. *aegyptiaca*, n. var.
L. limonense (Cushman)
Neobulimina cf. *canadensis* Cushman & Wickenden
Reussella aegyptiaca, n. sp.
R. buliminoides Brotzen
Siphogenerina esnehensis, n. sp.
S. mayi Cushman & Parker
Uvigerina elongata Cole

Ellipsoidinidae

Ellipsonodosaria alexanderi Cushman
E. atlantisae Cushman
E. horridens Cushman
E. midwayensis Cushman & Todd
E. paleocenica Cushman & Todd
E. stephensoni var. *speciosa* Cushman
Nodosarella gracillima Cushman
Pleurostomella alternans Schwager

Rotaliidae

Alabamina floscellus (Schwager)
Discorbis pseudoscopos, n. sp.
D. pseudoscopos var. *duwi*, n. var.
Eponides candidula (Schwager)
E. lotus (Schwager)
E. umbonata (Reuss)
Gyroidina flavescens d'Orbigny
G. flavescens var. *mellahensis*, n. var.
G. girardana (Reuss)
G. infrafosa (Finlay)
G. nitida (Reuss)
Rotalia lancicula (Schwager)
R. mensilla (Schwager)
R. mokattamensis (Schwager)
R. rigida (Schwager)
Stensiöina esnehensis, n. sp.
Valvulineria esnehensis, n. sp.

Chilostomellidae

Pullenia cretacea Cushman
P. quaternaria (Reuss)
P. quinqueloba (Reuss)
P. reussi Cushman & Todd

Globigerinidae

Globigerina bulloides d'Orbigny
G. cretacea d'Orbigny
G. cretacea var. *esnehensis*, n. var.
G. linaperta Finlay
G. quadrata White
Orbulina universa d'Orbigny
Schackoina senoniensis (Thalmann)

Globorotaliidae

Globorotalia colligera (Schwager)
G. colligera var. *crassaformis* (Galloway & Wisseler)
G. crassata (Cushman) var. *aequa* Cushman & Renz
G. deceptoria (Schwager)
G. simulatilis (Schwager)
G. velascoensis (Cushman)
Globotruncana aegyptiaca, n. sp.
G. aegyptiaca var. *duwi*, n. var.
G. aegyptiaca var. 1, n. var.
G. arca (Cushman)
G. arca var. *esnehensis*, n. var.
G. cretacea Cushman

Anomalinidae

Anomalina ammonoides (Reuss)
A. grosserugosa (Gumbel)
A. insecta Schwager
A. luxorensis, n. sp.
A. pseudoacuta, n. sp.
A. scrobiculata Schwager
A. scrobiculata var. *esnehensis*, n. var.
A. sphaeruligera (Schwager)
A. umbonifera (Schwager)
Cibicides abudurbensis, n. sp.
C. multifaria (Schwager)
C. multifaria var. *mellahensis*, n. var.
C. praecursorius (Schwager)
C. semiplecta (Schwager)
Planulina ammonis Ehrenberg)

SYSTEMATIC DESCRIPTIONS

Order FORAMINIFERA

Family LITUOLIDAE

Genus AMMOBACULITES Cushman, 1910

AMMOBACULITES ESNEHENSIS Nakkady, n. sp.

Plate 89, figures 1, 2

Test comparatively large and stout; of whitish color. Wall coarsely arenaceous with a considerable proportion of cement and raised into tubercles which are a rather characteristic feature of this species. Early chambers closely coiled with the central

area depressed; the last two or three are in linear arrangement and somewhat nodose. Sutures in the uncoiled portion depressed and distinct. Aperture terminal, semilunar, in a large rounded depression.

This is a form which is not very similar to any previously described species. Its nearest ally is *A. goodlandensis* Cushman & Alexander, from which it differs mainly in the shape of the aperture and the more coiled linear portion.

Holotype.—Plate 89, figure 1, from sample Dar. 285 in Abu Durba section. Diameter, 1 mm.; length, 1.65 mm.

Rather frequent near the base of the Esna shales of Abu Durba and rare near the top of the shales at Wadi Danili, western Sinai.

AMMOBACULITES ESNEHENSIS
var. NUDUS Nakkady, n. var.
Plate 89, figure 3

Rare specimens from sample Dar. 79 of the Wadi Danili section, which also yielded typical individuals, have much smoother surfaces and no tubercles.

Diameter of holotype, 1 mm.; length, 1.45 mm.

Family VERNEUILINIDAE
Genus GAUDRYINA d'Orbigny, 1839
GAUDRYINA SOLDADOENSIS var.
CAVUS-DULCIS Nakkady,
n. var.
Plate 89, figures 4, 5

This variety has a more smoothly finished surface, sides more excavated and sutures less deep than those of the typical form.

Holotype.—Plate 89, figure 4, from sample P. 1678, Mellaha section. Length, 1 mm.; breadth, 0.55 mm.; thickness, 0.40 mm.

Rare near the top of the Esna shales in the Wadi Mellaha section, Eastern Desert.

Genus VERNEUILINA d'Orbigny, 1840
VERNEUILINA LUXORENSIS
Nakkady, n. sp.
Plate 89, figures 6, 7

Test pyramidal, compressed and much excavated on the three lateral faces, edges thin; formed of numerous chambers, three to each whorl, arranged regularly in longitudinal series. Chambers long and narrow, septal faces in form of isosceles triangles, sutures usually slightly depressed (in smoothly finished forms hardly, if at all, depressed), slightly oblique and very slightly curved, or oblique and straight. The aperture is a textularian arched opening at the base of the inner margin of the last chamber. The wall is variable in coarseness; some specimens have much cement and smoothly finished surfaces.

This species is distinguished easily from *V. variabilis* Brady by the texture and more regular form of the test and the shape and position of the aperture.

Holotype.—Plate 89, figure 6. Length, 0.55 mm.; breadth, 0.50 mm.

Rare in a few samples near the top of the Luxor and Wadi Mellaha sections and near the middle of the shales at Abu Durba.

Family LAGENIDAE
Genus ROBULUS Montfort, 1908
ROBULUS MELLAHENSIS
Nakkady, n. sp.
Plate 89, figures 8, 9

Test closely coiled, periphery keeled, chambers distinct but rather narrow, sutures strongly limbate and raised, very slightly curved, radiating from a comparatively small central boss. Aperture an oval opening at the apex of a small septal face, with radiate slits round the peripheral angle.

This species shows close relationship to many previously described. Its nearest ally is *R. midwayensis* (Plummer) from which it can be distinguished by the thicker sutures and the less conspicuous umbo and keel. *R. pseudo-secans* is another very similar form from which the present species differs by its thicker sutures and the usually greater number of chambers.

Holotype.—Plate 89, figure 8. Diameter, 0.60 mm.; thickness, 0.35 mm.

Rare to abundant in the basal Chalk samples below the Esna shales of the Wadi Mellaha section.

ROBULUS MELLAHENSIS var.
OBESUS Nakkady, n. var.
Plate 89, figures 10, 11

This variety is more full-bodied than the typical form, has fewer chambers (about six to eight) and sutures that are thinner and more curved.

Holotype.—Plate 89, figure 10. Diameter, 0.70 mm.; thickness, 0.55 mm.

This variety is more common than the typical form, being frequent in almost all Wadi Mellaha Esna shale samples. It also occurs rarely in some Luxor and Abu Durba samples and is a frequent form in the lower Eocene at Abu Durba.

Genus MARGINULINA d'Orbigny, 1826

MARGINULINA WETHERELLII var. INTERCOSTATA Nakkady, n. var.

Plate 89, figure 12

The sutures are marked by beaded tubercules as in the typical form, but the chamber walls between them are ornamented with more or less fine parallel ridges.

Holotype.—From sample P. 1678 Mellaha. Measures 1.60 mm. in length and 0.40 mm. in breadth.

Rather rare in a few Luxor and Mellaha samples.

MARGINULINA WETHERELLII var. LONGICOSTATA Nakkady, n. var.

Plate 89, figure 13

This form is a further variational stage of *M. wetherellii*. The ridges are higher and more elongated, but they are interrupted at the sutures which are not raised or tubercled.

Holotype.—From sample P. 2545 Luxor. Length, 1.35 mm.; breadth, 0.40 mm.

Rare, from sample P. 2545 Luxor. The specimens are broken or fragmented.

Genus PALMULA Lea, 1833

PALMULA WOODI Nakkady, n. sp.

Plate 89, figure 24

Test much compressed except in early coiled portion which rises above the general level. Periphery truncate. Chambers distinct, the early ones closely coiled, later in the adult stage assuming an inverted V-shape; early chambers largely embracing the preceding ones. Sutures distinct, only slightly raised and coiled. Aperture terminal and radiate. Some specimens have the positions of the consecutive apertures marked by raised beads. Wall smooth. This species is not very similar to any previously described. *P. mecglameryae* (Jour. Paleontology, vol. 15, 1941, p. 592; pl. 80 figs. 1–3) resembles the present form but its wall is ornamented with bluntly rounded ridges.

Macfadyen in 1930 identified a single specimen from the Clysmic area of Egypt as *Frondicularia jonesi* Karrer; this specimen resembles young forms of the present species much more than it does Karrer's type.

EXPLANATION OF PLATE 89

FIGS. *1, 2*—*Ammobaculites esnehensis* Nakkady, n. sp. *1*, Holotype; *2*, apertural view of another specimen; ×25. (p. 682)

3—*Ammobaculites esnehensis* var. *nudus* Nakkady, n. var. Holotype; ×20. (p. 683)

4, 5—*Gaudryina soldadoensis* Cushman and Renz var. *cavus-dulcis* Nakkady, n. var. *4*, Holotype; *5*, apertural view of another specimen; ×25. (p. 683)

6, 7—*Verneuilina luxorensis* Nakkady, n. sp. *6*, Holotype; *7*, side view; ×36. (p. 683)

8, 9—*Robulus mellahensis* Nakkady, n. sp. *8*, Holotype; *9*, peripheral view; ×23. (p. 683)

10, 11—*Robulus mellahensis* var. *obesus* Nakkady, n. var. *10*, Peripheral view; *11*, holotype; ×36. (p. 683)

12—*Marginulina wetherellii* Jones var. *intercostata* Nakkady, n. var. Holotype; ×42. (p. 684)

13—*Marginulina wetherellii* Jones var. *longicostata* Nakkady, n. var. Holotype; ×33. (p. 684)

14—*Loxostoma applinae* (Plummer) var. *aegyptiaca* Nakkady, n. var. Holotype; ×60. (p. 687)

15—*Bolivina woodi* Nakkady, n. sp. Holotype; ×76. (p. 687)

16—*Bolivina esnehensis* Nakkady, n. sp. Holotype; ×53. (p. 687)

17—*Siphogenerina esnehensis* Nakkady, n. sp. Holotype; ×26. (p. 688)

18—*Eouvigerina aegyptiaca* Nakkady, n. sp. Holotype; ×66. (p. 686)

19—*Gümbelina striata* (Ehrenberg) var. *compressa*, Nakkady, n. var. Holotype; ×36. (p. 686)

20—*Siphogenerinoides oveyi* Nakkady, n. sp. Holotype; ×30. (p. 686)

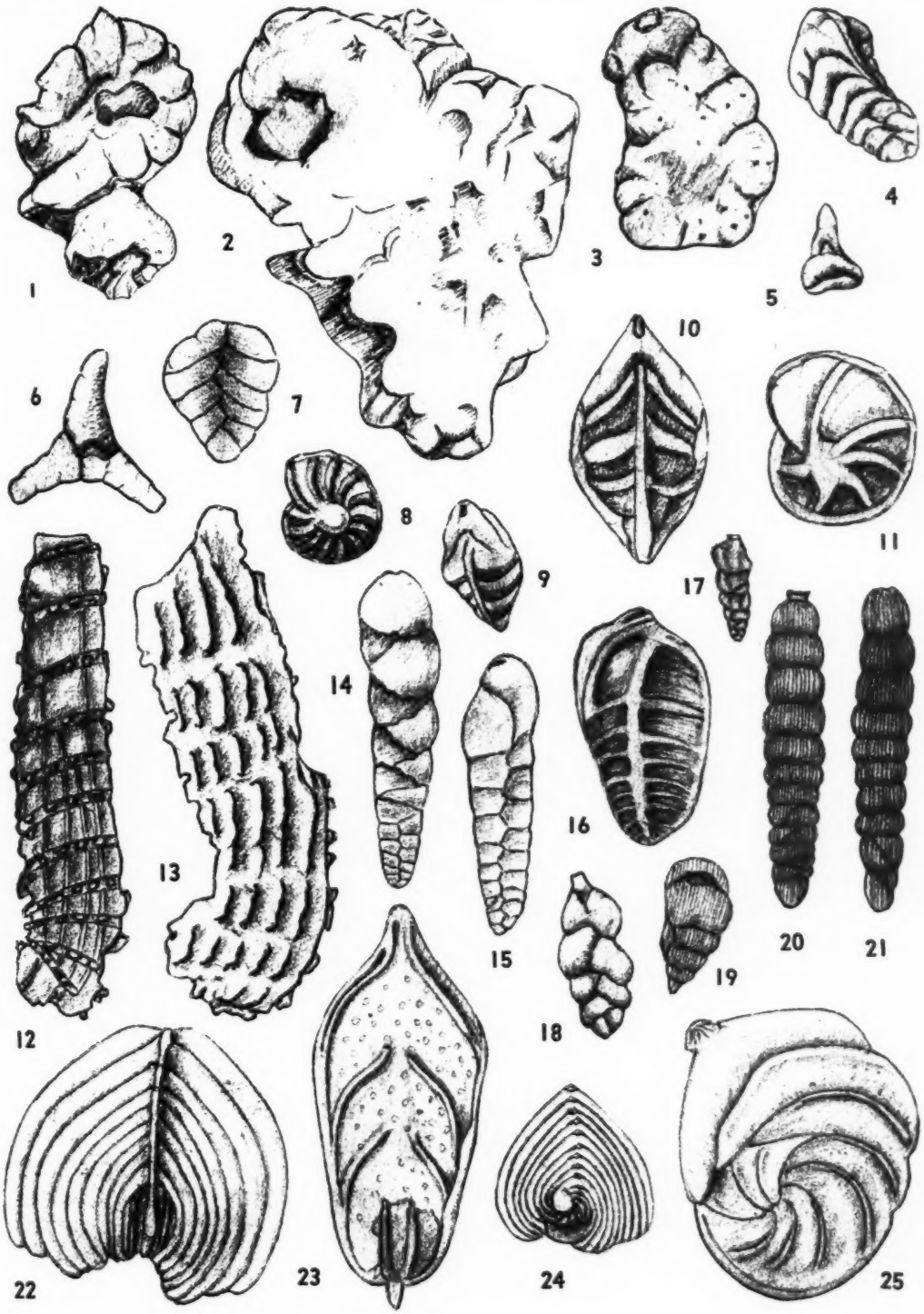
21—*Siphogenerinoides oveyi* var. *compressa* Nakkady, n. var. Holotype; ×27.5. (p. 687)

22—*Frondicularia wanneri* Nakkady, n. sp. ×16.8. (p. 685)

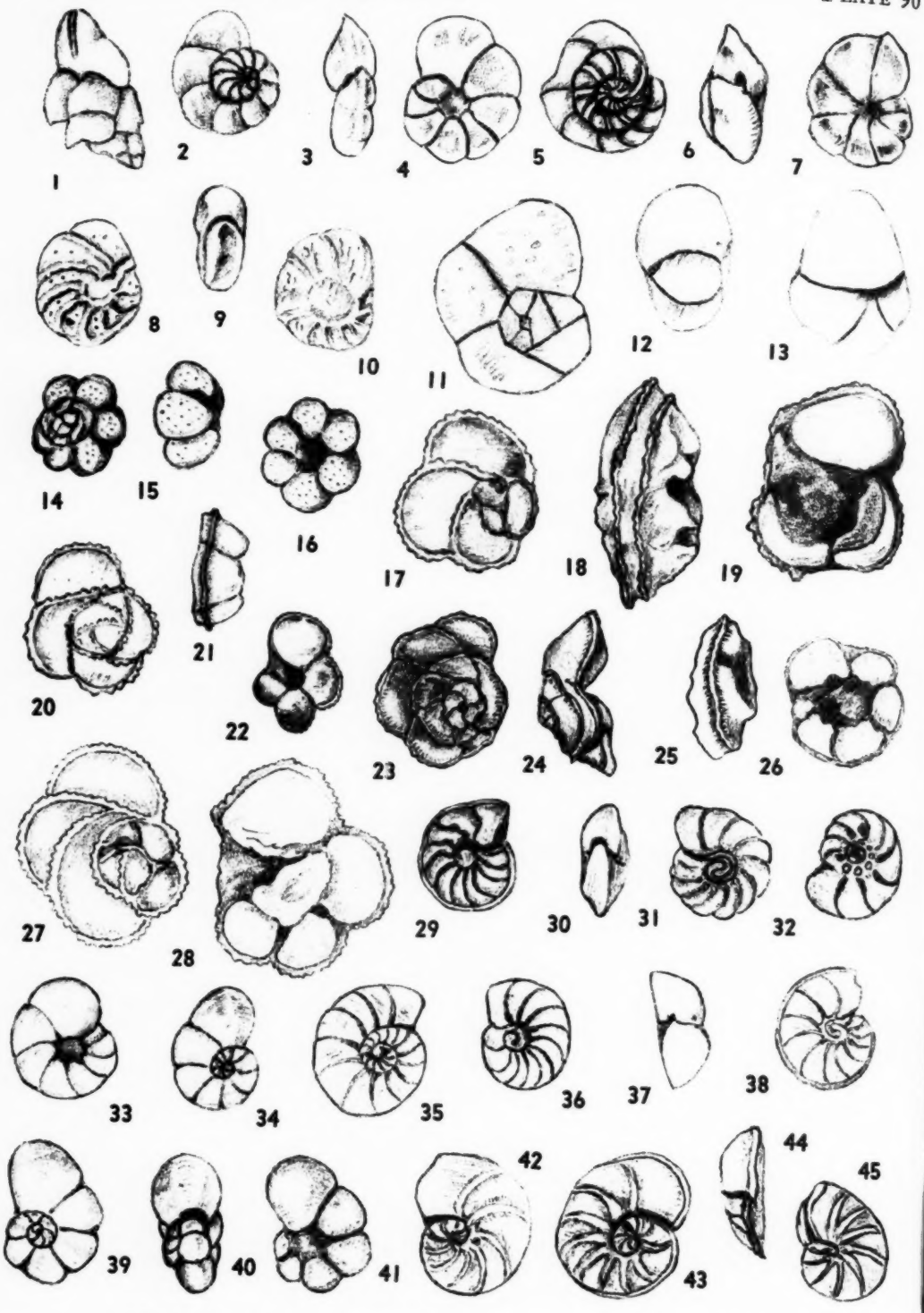
23—*Frondicularia esnehensis* Nakkady, n. sp. Holotype; ×62. (p. 685)

24—*Palmula woodi* Nakkady, n. sp. Holotype; ×6.8. (p. 684)

25—*Palmula woodi* var. *undulata* Nakkady, n. var. Holotype; ×42. (p. 685)



Nakkady, Esna shale and Upper Cretaceous Foraminifera



Nakkady, Esna shale and Upper Cretaceous Foraminifera

Holotype.—From sample T. 2351 Gebel Duwi. Length, 3.2 mm.; greatest breadth, 3.2 mm.

Confined to the Esna shales of Gebel Duwi where it is frequent to rare in a number of samples. The species is named after Professor Alan Wood.

PALMULA WOODI var. UNDULATA
Nakkady, n. var.
Plate 89, figure 25

This variety differs from the typical form in the undulation of the outer periphery which results from shortening of the chambers.

Length of holotype, 1 mm.; breadth, 0.75.

Rare in the basal shale sample of Gebel Duwi.

Genus FRONDICULARIA
Defrance, 1826

FRONDICULARIA ESNEHENSIS
Nakkady, n. sp.
Plate 89, figure 23

Test compressed, greatest breadth near the apertural end; periphery truncate. Chambers distinct, not inflated, gradually increasing in size as added. Proloculum rounded and inflated with two longitudinal costae on either side. Sutures distinct, slightly raised; wall between sutures with a series of small raised papillae like those of *Palmula rugosa* (d'Orbigny). Initial end with a spine. Aperture terminal, radiate, at the end of a neck.

This species can be compared with *F. angulosa* d'Orbigny, but its chambers are more overlapping, the wall is papillate and the test is broadest near the apertural end.

Holotype.—From sample Dar. 295 of the Abu Durba section. Length, 0.90 mm.; greatest breadth, 0.40 mm.

Rare in the basal samples of the shales at Abu Durba.

FRONDICULARIA WANNERI
Nakkady, n. sp.
Plate 89, figure 22

Frondicularia WANNER, n. sp., 1902, Palaeontographica, vol. 30, Abt. 2, p. 96, pl. 13, fig. 4.

Test compressed, as broad or broader than long, greatest breadth near base. Sides strongly rounded, periphery truncate. Chambers numerous, narrow. Proloculum

---

EXPLANATION OF PLATE 90

FIG. *1*—*Reussella aegyptiaca* Nakkady, n. sp. Holotype; ×8.3. (p. 687)
2–4—*Discorbis pseudoscopos* Nakkady, n. sp. *2*, Holotype; *3*, *4*, peripheral and ventral aspects of two other specimens; ×27. (p. 688)
5–7—*Discorbis pseudoscopos* var. *duwi* Nakkady, n. var. *5*, Holotype; *6*, *7*, peripheral and ventral aspects of two other specimens. (p. 689)
8–10—*Stensiöina esnehensis* Nakkady, n. sp. *8*, Holotype, dorsal view, ×60; *9*, *10*, peripheral and ventral aspects of two other specimens, ×40. (p. 689)
11–13—*Valvulineria esnehensis* Nakkady, n. sp. *11*, Dorsal side of holotype; *12*, *13*, peripheral and ventral aspects of two other specimens; ×45. (p. 689)
14–16—*Globigerina cretacea* d'Orbigny var. *esnehensis* Nakkady, n. var. *16*, Ventral view of holotype; *14*, *15*, dorsal and peripheral aspects of two other specimens; ×40. (p. 689)
17–19—*Globotruncana aegyptiaca* var. *duwi* Nakkady, n. var. *17*, Dorsal side of holotype; *18*, *19*, peripheral and ventral aspects of two other specimens; ×70. (p. 690)
20–22—*Globotruncana aegyptiaca* Nakkady, n. sp. *20*, Dorsal side of holotype; *21*, *22*, peripheral and ventral aspects of two other specimens; ×40. (p. 690)
23–26—*Globotruncana arca* (Cushman) var. *esnehensis* Nakkady, n. var. *23*, Dorsal side of holotype; *24*, *25*, peripheral views; *26*, ventral aspects of other specimens; ×40. (p. 690)
27, *28*—*Globotruncana aegyptiaca* var. I. *27*, Dorsal side of holotype; *28*, ventral side of another specimen; ×70. (p. 690)
29–32—*Anomalina pseudoacuta* Nakkady, n. sp. *29*, Dorsal side of holotype; *31*, *32*, ventral aspects; *30*, peripheral view of other specimens; ×30. (p. 691)
33, *34*—*Anomalina scrobiculata* Schwager var. *esnehensis* Nakkady, n. var. *33*, Ventral side of holotype; *34*, dorsal aspect of another specimen; ×30. (p. 691)
35–38—*Cibicides abudurbensis* Nakkady, n. sp. *35*, Dorsal side of holotype; *36–38*, dorsal, peripheral and ventral aspects of other specimens; ×40. (p. 691)
39–41—*Anomalina luxorensis* Nakkady, n. sp. *41*, Ventral aspect of holotype; *39*, *40*, dorsal and peripheral aspects of other specimens; ×80. (p. 691)
42–45—*Cibicides multifaria* (Schwager) var. *mellahensis* Nakkady, n. var. *43*, Dorsal side of holotype; *42*, *44*, *45*, dorsal, peripheral and ventral aspects of other specimens; ×60. (p. 692)

with three costae, the central one prominently raised and extending to the apertural end. Sutures distinct, hardly if at all depressed. Aperture terminal.

Holotype.—From sample T. 2370 of the Gebel Duwi section. Length, 1.90 mm.; greatest breadth, 2 mm.

Rare to frequent in the middle to top shale samples of Gebel Duwi. Wanner's specimen came from the Chalk of the Western Desert of Egypt.

Family HETEROHELICIDAE
Genus EOUVIGERINA
Cushman, 1926
EOUVIGERINA AEGYPTIACA
Nakkady, n. sp.
Plate 89, figure 18

Test elongate, slender, tapering at both ends, Greatest width formed by last chamber. Earliest chambers (only visible in some specimens) planispiral. The biserial portion constitutes about one-third the length of the test. Later chambers become uniserial. Last chamber large, almost hemispherical, with a small depression on either side. Sutures deep. Aperture rounded, at the end of a short cylindrical neck, Wall smooth, finely perforate.

This species is quite different from any previously described. It is best compared with *E. gracilis* Cushman from which it differs in having a smooth nonspinose surface and in the presence of a groove on either side of the last chamber.

Holotype.—From Dar. 290 of the Abu Durba section, western Sinai. Length, 0.35 mm.; breadth, 0.15 mm.; thickness, 0.10 mm.

This species is rare to abundant from the basal samples of the Esna shales and the underlying Chalk from the Gebel Duwi, Wadi Danili and Abu Durba sections.

Genus GÜMBELINA Egger, 1899
GÜMBELINA STRIATA var. COMPRESSA
Nakkady, n. var.
Plate 89, figure 19

This variety differs from the type (Ehrenberg, 1840, fig. 9) in being much compressed in a direction perpendicular to the axis of growth and the chambers are more compact and more coarsely ornamented with costae. Very similar to the present variety are the four forms *Pseudotextularia* a, b, c, and d described by Plummer, which are obviously varieties of a single species of *Gümbelina*. Perhaps these should be placed in the synonymy of the present variety.

Holotype.—From the basal shale sample Dar. 290 of the Abu Durba section, western Sinai. Length, 0.55 mm.; breadth, 0.30 mm.; thickness, 0.35 mm.

Mostly flooding to abundant in the four sections, Gebel, Duwi, Wadi Mellaha, Abu Durba and Wadi Danili in the *Gümbelina-Globotruncana* zone. It has not been found elsewhere.

Genus SIPHOGENERINOIDES
Cushman, 1927
SIPHOGENERINOIDES OVEYI
Nakkady, n. sp.
Plate 89, figure 20

Test elongate, tapering gradually to the initial end, greatest breadth formed by the last chamber. Sides nearly parallel, test circular in section. Early stage biserial, forming about one-eighth the length of the test, remainder uniserial. Chambers distinct, increasing gradually in height as added, about seven to ten in the uniserial stage. Sutures depressed. Aperture terminal, rounded, with cylindrical neck and phialine lip. Wall finely perforate, with very fine longitudinal striations interrupted at the sutures.

This species is somewhat similar to *S. clarki* Cushman and Campbell of the Upper Cretaceous of California, but that species is shorter and stouter, having only slightly, if at all, depressed sutures, and a different aperture.

Holotype.—From top Chalk sample below the Esna shales of Gebel Duwi in the Eastern Desert. Length, 1.40 mm.; diameter, 0.30 mm.

This species is abundant to flooding in the lower Chalk samples of the Wadi Mellaha section and also flooding in the Chalk of Gebel Duwi. It occurs in the shales only as single to rare specimens. The species was named after Mr. C. D. Ovey of the British Museum (Natural History), London.

SIPHOGENERINOIDES OVEYI var. COMPRESSA Nakkady, n. var.
Plate 89, figure 21

This variety has a much compressed test, but otherwise it is similar to the typical form.

Holotype.—From top Chalk sample below the Esna shales of Gebel Duwi in the Eastern Desert. Length, 0.60 mm.; breadth, 0.30 mm.; thickness, 0.20 mm.

Abundant in the top Chalk sample at Gebel Duwi and rarer in the overlying shales.

Family BULIMINIDAE
Genus BOLIVINA d'Orbigny, 1939
BOLIVINA ESNEHENSIS
Nakkady, n. sp.
Plate 89, figure 16

Test elongate, compressed, rather broad in outline, periphery acute. Chambers keeled, about ten pairs distinct, low and curved, tending to loxostome structure in the last pair. Sutures strongly limbate and raised, gently curved. Aperture terminal, elongate. Wall smooth except for the raised sutures, finely perforate.

This species may be similar to the undescribed *B. aegyptiacum*, but Ehrenberg's figure is too poor to permit adequate comparison.

Holotype.—From the basal shale sample of the Wadi Mellaha section. Length, 0.60 mm.; breadth, 0.35 mm.; thickness, 0.15 mm.

This species was found in four of the five sections examined, and was missing only from the Wadi Danili section. It is best represented in the Mellaha section where it is present in all the Esna shale samples. Two specimens were found in the top sample of the Chalk at Wadi Mellaha.

BOLIVINA WOODI Nakkady, n. sp.
Plate 89, figure 15

Test elongate, slender, four or five times as long as broad, compressed, tapering to both ends, greatest breadth below the last pair of chambers. Periphery rounded. Early portion often twisted. Chambers usually not very distinct. Sutures hardly, if at all, depressed, nearly straight and horizontal. Wall distinctly perforate. Aperture an elongate loop on the inner face of the last chamber. There is a tendency toward loxostome structure in the last two chambers.

The species most similar to the present one is *B. colemani* Galloway and Morrey, from which it is distinguished by the absence of crenulations on the sutures, and by the fact that the junction between the two longitudinal series of chambers is more zigzagged. The test is also more compressed, smooth, not costate, more elongate and the aperture is relatively longer and situated on the inner face of the last formed chamber and not confined to the base of that chamber as in *B. colemani*.

Holotype.—From sample P. 2601 at the Luxor section. Length, 0.50 mm.; thickness, 0.10 mm.; breadth, 0.15 mm.

This is a rare form in the top samples at Luxor, Mellaha and Abu Durba, but is frequent or flooding in the Gebel Duwi section, where some specimens have slightly more depressed sutures. This species was not found in the overlying Eocene or the underlying Chalk beds.

Genus LOXOSTOMA Ehrenberg, 1854
LOXOSTOMA APPLINAE var. AEGYPTIACA Nakkady, n. var.
Plate 89, figure 14

In this variety the initial biserial arrangement of the chambers is apparent for at least one-fifth the length of the test, which is cylindrical. The aperture is small and ovoid and does not extend down the inner side of the last chamber as it does in many Egyptian specimens of the typical form although others have apertures exactly like that of this variety.

Holotype.—From sample Dar. 230 Abu Durba, western Sinai. Length, 0.75 mm.

This variety is rare near the top of the Esna shales at Wadi Mellaha and Abu Durba but more frequent at Gebel Duwi. It has also been found in the lower Eocene of Abu Durba.

Genus REUSSELLA Galloway, 1933
REUSSELLA AEGYPTIACA
Nakkady, n. sp.
Plate 90, figure 1

Test small, triserial, triangular in cross

section. Sides slightly concave, angles acute, the free ends of the chambers mostly projecting like triangular spines. Test tapers to an acute point at the initial end, is broadest at the last whorl. Chambers distinct, the last one with a rounded periphery, higher in position than the other two of the same whorl. Sutures slightly depressed, strongly oblique. Aperture an elongate slit extending from the base of the chamber all along the apertural face. Wall calcareous, finely perforate.

This species can be distinguished from *R. spinulosa* (Reuss) by its narrower sides, highly projecting and rounded last chamber and characteristic elongate aperture extending all along the apertural face. *R. cushmani* Brotzen is also a somewhat similar form.

Holotype.—From sample T 2325, top of the Chalk, just below Esna shales of Gebel Duwi. Length, 0.30 mm.; breadth, 0.20 mm.; thickness, 0.20 mm.

This species is best represented in the Chalk of Gebel Duwi where it is a flood form through all the samples. It is also abundant from one sample near the base of the Chalk at Mellaha. It has not been found in the Esna shales.

Genus SIPHOGENERINA Schlumberger, 1883

SIPHOGENERINA ESNEHENSIS Nakkady, n. sp.
Plate 89, figure 17

Test elongate, earliest portion triserial, merging in some specimens to a short biserial stage. Last portion uniserial, formed mostly of loosely attached, obliquely set chambers which tend toward a nodosarian arrangement and become nodosarian in the upper samples. Chambers distinct, especially in the later stages. Sutures distinct, depressed. Aperture terminal, elliptical, bounded by a short flaring rim. Wall coarsely perforate in earlier Chalk samples with very short spinulose projections, becoming smoother and minutely perforate in specimens from higher samples. Progressive changes occur in this species in the successive samples from the Cretaceous Chalk to the top of the Esna shales. There is an increasing tendency for the formation of a smooth test with a very short triserial stage and an elongate uniserial portion with closely set nodosarian chambers. Longitudinal costae, which in the beginning occur on only a small part of the test, develop until they cover all the chambers, resulting in the final emergence of *S. mayi* Cushman and Parker.

This species can be compared with *Siphogenerinoides eleganta* (Plummer) which appears in higher stratigraphic zones. The latter is obviously an evolutionary development from the present species which differs in having an early triserial stage and loosely set later chambers.

Holotype.—From sample T. 2326 Gebel Duwi. Length, 0.60 mm.

This species is best represented in the Chalk, particularly that of Gebel Duwi, where it is abundant to flooding. It survives in the shales and at Gebel Duwi continues throughout them, but occurs mostly in less abundance. It was found also at Wadi Mellaha in the shales and Chalk.

Family ROTALIIDAE

Genus DISCORBIS Lamarck, 1804

DISCORBIS PSEUDOSCOPOS Nakkady, n. sp.
Plate 90, figures 2–4

Test of moderate size, umbilicate, unequally biconvex; ventral side slightly convex or even slightly concave; dorsal side more convex; periphery rounded lobate. Chambers seven to eight in last whorl, of uniform shape, increasing gradually in size as added. Sutures distinct, depressed on ventral side, slightly raised on inner whorl of dorsal side and depressed on outer whorl. Aperture a curved slit at base of last formed chamber, extending from wide open umbilicus to periphery.

The nearest ally of the present form is the Miocene *D. scopos* Finlay which has strongly limbate sutures, a sharp limbate keel, and a smaller hidden umbilicate aperture.

Holotype.—Plate 90, figure 2, from sample P. 1665 Mellaha. Diameter, 0.55 mm.; thickness, 0.15 mm.

This species flourished chiefly in the Chalk and the basal samples of the shales. It is best represented at Gebel Duwi where it is abundant to flooding in the Chalk, becoming less frequent upwards in the shales.

DISCORBIS PSEUDOSCOPOS var. DUWI
Nakkady, n. var.
Plate 90, figures 5–7

This variety is full-bodied and much stouter than the typical form. Periphery subacute, sutures on dorsal side of inner whorl strongly limbate and highly raised. Aperture large instead of being only a slit as in the typical form.

Holotype.—Plate 90, figure 5, from T. 2326, at the base of the Esna shales of Gebel Duwi. Diameter, 0.30 mm.; thickness 0.30 mm.

Flooding at the base of the shales of Gebel Duwi, continuing in a few samples upwards as a rather rare form.

Genus STENSIÖINA Brotzen, 1936
STENSIÖINA ESNEHENSIS Nakkady, n. sp.
Plate 90, figures 8–10

Test planoconvex, dorsal side flat, ventral side dome shaped. About two whorls visible on the dorsal side, where chambers are distinct, sutures curved, raised and ornate. About ten chambers in last whorl, ventral umbilicus large, shallow. Ventral sutures slightly raised, gently curved. Wall calcareous, perforate, Aperture an arched slit at base of chamber on ventral side.

S. excolata (Cushman) 1940 (Cushman Lab. Foram. Res. Contr., vol. 16, pt. 1, p. 4, fig. 6) is a very similar form, but the ventral side is smooth and the chambers are indistinct.

Holotype.—Plate 90, figure 8, from sample Dar. 63 Wadi Danili. Diameter, 0.40 mm.; thickness, 0.20 mm.

This species is abundant at the base of the shales at Wadi Danili and occurs as single specimens upwards to near the top of the formation.

Genus VALVULINERIA Cushman, 1926
VALVULINERIA ESNEHENSIS Nakkady, n. sp.
Plate 90, figures 11–13

Test trochoid, unequally biconvex, ventral side more convex than dorsal, periphery rounded, Chambers distinct, five or six in last whorl. Chambers inflated ventrally, umbilicus open. Inner edge of last chamber develops a lip extending more or less over umbilicus, sometimes covering a good part of it and hiding aperture underneath, which is large at base of chamber and extends from umbilicus to periphery. Sutures depressed, radiate or very slightly curved. Wall calcareous, distinctly perforate.

V. advena Cushman is a similar form but has a more rounded outline and fewer chambers and convolutions. *V. texana* Cushman is another very close ally but this also has a more rounded outline and a prolongation from the last chamber, semicircular in shape, filling the umbilicus.

Holotype.—Plate 90, figure 11, from sample Dar. 280 Abu Durba, western Sinai. Length, 0.60 mm.; breadth, 0.50 mm.; thickness, 0.30 mm.

Rare to frequent in the basal samples of the shales at Abu Durba and Wadi Danili.

Family GLOBIGERINIDAE
Genus GLOBIGERINA d'Orbigny, 1826
GLOBIGERINA CRETACEA var. ESNEHENSIS
Nakkady, n. var.
Plate 90, figures 14–16

This variety is distinguished from the typical form by being stouter, larger, thicker shelled, more coarsely perforate and having a rougher surface. It has five to seven chambers in the last whorl and these are of regular shape and size. Schwager (1883) figured a form similar to this variety from the Mokattam Stufe of Egypt but having only one whorl of chambers. *G. concinna* Reuss is somewhat similar but also has fewer convolutions. *G. dubia* Egger is much more pronouncedly trochoid and *G. dutertrei* is a near ally but has a large last chamber.

Holotype.—Plate 90, figure 16, from sample Dar. 230 Abu Durba. Diameter, 0.40 mm.; thickness, 0.30 mm.

This variety seems to be best developed high in the shales where it replaces *G. cretacea*. It is flooding to abundant in the top shale and lower Eocene samples of Abu Durba, restricted to the lower Eocene (abundant to frequent) at Wadi Danili, but appears at a lower zone at Gebel Duwi, where it becomes a flooding form only higher in the shales and extends to the lower Eocene. In the Luxor section, which represents a slightly higher zone than the other sections, it is flooding in almost all samples.

Family GLOBOROTALIIDAE
Genus GLOBOTRUNCANA Cushman, 1927
GLOBOTRUNCANA AEGYPTIACA
Nakkady, n. sp.
Plate 90, figures 20–22

Test planoconvex, dorsal side always flat, ventral side convex, Periphery acute, lobulate, single keeled in most specimens but occasionally with a double keel, sometimes spinose. Chambers, particularly the last ones, petalloid, four in the last whorl. Sutures distinct, radial, depressed ventrally, beaded, raised, strongly curved dorsally. Aperture ventral, large, arched, at base of last chamber, opening into wide umbilicus. Wall finely perforate. This species is a very close ally to *G. cretacea* Cushman from which it differs by the more petalloid shape and fewer chambers. *G. aegyptiaca* is distinguished from *Globorotalia colligera* (Schwager), which is probably its direct descendent, by the raised and beaded dorsal sutures, the aperture, and the wide ventral umbilicus. In all other respects they are very much alike.

Holotype.—Plate 90, figure 20, from sample Dar. 290, near base of the shales at Abu Durba. Measurements: 0.50 mm. in length and 0.20 mm. thick.

Rare to abundant in the first two Chalk samples of Wadi Mellaha and in the basal shale samples of Abu Durba and Wadi Danili; frequent to abundant in the Chalk of Gebel Duwi.

GLOBOTRUNCANA AEGYPTIACA var. DUWI Nakkady, n. var.
Plate 90, figures 17–19

The last chamber constitutes about half of the test. Only three chambers are usually visible from the ventral side. The first chamber of the last whorl is usually much smaller than the others which follow, and this has affected the general shape of the test and the arrangement of the chambers so that the suture between the second and third chambers in the last whorl is in the middle of the sides of the test. Sutures much curved. Periphery sharp as in the typical form and sometimes double keeled as shown in figure 18.

This variety is related to the typical form in the same manner as *Globorotalia crassata* var. *aequa* is related to *Globorotalia colligera*. It is probably the ancestor of *Globorotalia crassata* var. *aequa* which is very similar and appears in higher stratigraphic zones. The *Globotruncana* variety is distinguished by the double keel, the dorsally beaded sutures, the wide umbilicus, and the shape and position of the ventral aperture.

Holotype.—Plate 90, figure 17, from sample T 2324 of the Gebel Duwi Chalk. Length, 0.30 mm.; breadth, 0.25 mm.; thickness, 0.15 mm.

Rather frequent in the Chalk at Gebel Duwi.

GLOBOTRUNCANA AEGYPTIACA var 1
Plate 90, figures 27, 28

This variety has a rounded periphery instead of the sharp keel of the typical form. These are related in much the same way as *Globorotalia colligera* var. *crassaformis* (Galloway and Wissler) is related to the typical form.

Holotype.—Plate 90, figure 27, from Chalk sample T 2322 of Gebel Duwi. Length, 0.40 mm.; thickness, 0.25 mm.; breadth, 0.30 mm.

Frequent in this sample.

GLOBOTRUNCANA ARCA var. ESNEHENSIS
Nakkady, n. var.
Plate 90, figures 23–26

This variety has the dorsal side more convex than the ventral in most specimens but some which are more or less equally biconvex obviously link it to the typical form.

It is somewhat similar to *G. conica* White, but has fewer whorls and chambers and the sutures on the dorsal side are more curved. Some specimens which have a conspicuously large last chamber are very similar to *G. convexa* Sandidge, but they lack the secondary keel.

Holotype.—Plate 90, figure 23, from sample Dar. 295, the basal sample of the shales at Abu Durba. Diameter, 0.50 mm., thickness, 0.30 mm.

This variety is frequent in the *Globotruncana-Gümbelina* zone of the Abu Durba and Mellaha sections and floods the Chalk at Gebel Duwi.

Family ANOMALINIDAE
Genus ANOMALINA d'Orbigny, 1826
ANOMALINA LUXORENSIS Nakkady, n. sp.
Plate 90, figures 39–41

Test almost equally biconvex, wall clearly perforate, periphery broadly rounded, lobulated, umbilical region deeply depressed. All chambers visible from dorsal side, which shows two whorls with six to seven chambers in last whorl. Chambers increase very rapidly in size as added, the last two forming about half the test. Sutures very distinct, depressed. Aperture a large arched opening situated in the median line at base of last formed chamber.

This species is very similar to *A. subbadensis* Pijpers, but the chambers are more inflated, the last chamber is invariably large and rounded, and the aperture is characteristically large and arched, whereas it is indistinct in the other species.

Holotype.—Plate 90, figure 41, from sample Dar. 231 at Abu Durba. Length, 0.25 mm.; thickness, 0.15 mm.; breadth, 0.20 mm.

This species has been found in four sections. It is best represented and flooding in the top shale sample at Abu Durba. Elsewhere it is rare to frequent. It has not been found at Wadi Danili.

ANOMALINA PSEUDOACUTA Nakkady, n. sp.
Plate 90, figures 29–32

Test biconvex, dorsal side less convex than ventral, distinctly perforate, periphery subacute. Chambers narrow, curved, numerous, nine to 15 in last whorl. Sutures limbate, sometimes strongly so. On dorsal side there is a prominent central boss of clear shell material. On ventral side the sutures terminate near center in a series of fine beads which surround a thick, irregular spiral of translucent shell substance. Some specimens show a distinct keel. Aperture an arched opening in the median line at base of last formed chamber.

This species is very similar to *Anomalinoides acuta* (Plummer) from which it differs mainly in the character of the aperture which is constant, always peripheral, and does not extend towards the umbilicus. The aperture is not marginal as in Mrs. Plummer's species, the character of which necessitates its transfer from *Anomalina* to Brotzen's genus *Anomalinoides* (Brotzen, 1948, p. 87, pl. 14, fig. 2).

Holotype.—Plate 90, figure 29, from sample Dar. 290, at the base of the shales at Abu Durba. Length, 0.50 mm.; thickness, 0.25 mm.; breadth, 0.45 mm.

This species is very well represented as a frequent to flooding form in the Esna shales and the Cretaceous Chalk, although it is very rare at Luxor. It is abundant in the Chalk and seems to have flourished greatly in early Esna shale time, but disappears at about the middle of that formation.

ANOMALINA SCROBICULATA var.
ESNEHENSIS Nakkady, n. var.
Plate 90, figures 33, 34

This variety differs from the typical form in the larger size of the last chambers and the slight convexity of the dorsal side. It differs from *A. restinensis* Berry, which is very similar, in having an open uncovered umbilicus.

Holotype.—Plate 90, figure 33, from sample Dar. 231, at Abu Durba. Length, 0.50 mm.; thickness, 0.25 mm.; breadth, 0.40 mm.

Rare in the upper Esna shale samples at Luxor and Mellaha and at the base of the shale at Gebel Duwi. It has also been found as a rare form in the top sample of Abu Durba.

Genus CIBICIDES Montfort, 1808
CIBICIDES ABUDURBENSIS Nakkady, n. sp.
Plate 90, figures 35–38

Test planoconvex, dorsal side flat or slightly concave, ventral side strongly convex, periphery subacute, distinctly perforate. Chambers narrow, curving, numerous, about 12 in last whorl. All chambers of the two whorls forming test can be seen from dorsal side, Chambers of inner whorl much smaller than those of succeeding whorl and have in center a very small boss which does not show on many specimens. Sutures limbate, slightly raised, surrounding on ventral side a small irregular spiral of translucent shell material. Some specimens with distinct keel. Aperture median, at base of last chamber, in a few specimens can be seen to extend dorsally.

This species is very similar to the Esna shale species *Anomalina pseudoacuta* from

which it can be distinguished by its flat dorsal side, dorsally more evolute form and its indistinct central boss.

Holotype.—Plate 90, figure 35, from sample Dar. 290, near base of the shales at Abu Durba. Diameter, 0.40 mm.; thickness, 0.20 mm.

This species was first noted in the Abu Durba samples, where it is frequent to abundant at the base of the shales but disappears upward after a few samples. It is rare in the basal shale sample of Wadi Danili and frequent in the Chalk at both Danili and Abu Durba.

CIBICIDES MULTIFARIA var. MELLAHENSIS
Nakkady, n. var.
Plate 90, figures 42–45

This variety is mainly distinguished from the typical form by its strongly limbate and raised sutures. Although variation in the typical form is striking, the present variety is worthy of recognition because its characters are constant in a large number of specimens from the three localities where it has been found.

Holotype.—Plate 90, figure 43, from sample P. 1669 at Wadi Mellaha. Length, 0.35 mm.; thickness, 0.10 mm.; breadth, 0.30 mm.

Best represented in the basal shale samples of Mellaha, where it is abundant to frequent, and at Gebel Duwi, where it occurs higher, near the middle of the shales. It is very rare at Abu Durba.

REFERENCES

BRADY, H. B., 1844, Report on the Foraminifera dredged by H.M.S. Challenger: Voyage Challenger Rept., Zoology, vol. 9.

BROTZEN, F., 1934, Foraminiferen aus dem Senon Palastinas: Zeitschr. Deutsch. Palestina-Vereins, vol. 57, pp. 28–72.

——, 1935, Foraminiferen aus dem schwedischen untersten Senon von Eriksdal in Schonen: Sveriges geol. undersökning, ser. C, no. 396, vol. 30, no. 3.

——, 1948, Paleocene of Sweden: Sveriges geol. undersökning, vol. 43, p. 87.

CUSHMAN, J. A., 1937a, A monograph of the foraminiferal family Verneuilinidae: Cushman Lab. Foram. Res. Spec. Pub. 7.

——, 1937b, A monograph of the foraminiferal family Valvulinidae: Cushman Lab. Foram. Res. Spec. Pub. 8.

——, 1940, Midway Foraminifera from Alabama: Cushman Lab. Foram. Res. Contr., vol. 16, pp. 51–73.

——, 1946, A supplement to the monograph of the foraminiferal family Verneuilinidae: Cushman Lab. Foram. Res. Spec. Pub.

——, 1947, A supplement of the foraminiferal family Valvulinidae: Cushman Lab. Foram. Res. Spec. Pub.

——, and RENZ, H. H., 1942, Foraminifera from the Soldado rocks of Trinidad: Cushman Lab. Foram. Res. Contr., vol. 18, pp. 1–14.

——, and TODD, R., 1946, A foraminiferal fauna from the Paleocene of Arkansas: Cushman Lab. Foram. Res. Contr., vol. 22, pp. 45–65.

CUVILLIER, J., 1934, Le Nummulitique d'Egypte. Les Esna-shales et leur veritable signification stratigraphique: Inst. d'Egypta Bull., vol. 16, pp. 93–98.

EHRENBERG, C. G., 1854, Mikrogeologie, Das Wirken des unsichtbaren Kleinen Lebens auf der Erde. Leipzig.

ELLIS, B., and MESSINA, A. R., 1940, Catalogue of the Foraminifera: Am. Mus. Nat. Hist.

FARIS, M. I., 1946, The contact of the Cretaceous and Eocene rocks in the Taramsa-Tukh area: Inst. d'Egypte Bull., vol. 28, pp. 73–85.

HENSON, F. R. S., 1938, Stratigraphical correlation by small Foraminifera in Palestine and adjoining countries: Geol. Mag., vol. 75, pp. 227–233.

MARIE, P., 1936, Sur la microfaune Cretace' du Sud-Est du bassin de Paris: Acad. sci. Paris Comptes rendus, vol. 203, pp. 97–100.

——, 1938, Sur quelques foraminifères nouveaux ou peu connu du Cretace' du bassin de Paris: Soc. géol. France Bull., vol. 8, sér, pp. 91–104.

MACFAYDEN, W. A., 1930, Miocene Foraminifera from the Clysmic area of Egypt and Sinai: Geol. Survey Egypt.

D'ORBIGNY, A., 1840, Memoires sur les foraminifères de la Craie Blanche du bassin de Paris: Soc. géol. France Mem., vol. 4, pp. 1–51.

PLUMMER, H. J., 1927, Foraminifera of the Midway formation in Texas: Texas Univ. Bull. 2644.

REUSS, A. E., 1846, Die Versteinerungen der bohmischen Kreidformation, Stuttgart.

——, 1851, Ueber die fossilen Foraminiferen und Entomostraceen der Septarienthone der Umgegend von Berlin: Zeitschr. Deutsche Geol. Gesell., vol. 3, pp. 49–82.

SCHWAGER, C., 1883, Die Foraminiferen aus den Eocänblagerungen der Libyschen Wuste Aegypten: Paleontographica, vol. 30, pp. 80–153.

TROMP, S. W., 1941, Preliminary compilation of the stratigraphy, structural features and oil possibilities of S.E. Turkey and a comparison with neighbouring areas: Meteae. Pub. Min. Res. Ins. Turkey, ser. A, Tebligler, no. 4 (English text, pp. 19–34).

WANNER, J., 1902, Die Fauna der Obersten weissen Kreide der Libyschen Wuste: Palaeontographica, vol. 30.

WHITE, P., 1928–1929, Some index Foraminifera of the Tampico Embayment area of Mexico: Jour. Paleontology, vol. 2, pp. 177–215, 280–317, vol. 3, pp. 30–58.

JOURNAL OF PALEONTOLOGY, VOL. 24, NO. 6, PP. 693–698, 4 TEXT FIGS., NOVEMBER 1950

A PARALLEL GRINDING INSTRUMENT FOR THE INVESTIGATION OF FOSSILS BY SERIAL SECTIONS

W. N. CROFT
British Museum (Natural History)

ABSTRACT—A surface grinding instrument, primarily for grinding parallel sections of fossils at exact intervals down to 10 microns, is described and figured. The accuracy of the instrument in its application to paleontology is illustrated. Mention is also made of its use in cutting plates from crystals or other substances. It can either be operated by hand on a stationary grinding plate, or be used in conjunction with a mechanically rotated lap.

DURING the last 60 or 70 years more than a dozen different instruments for parallel grinding have been described. The earliest types were designed to cut and polish crystal plates and prisms, and the first instrument for grinding fossils to determine their inner structure was made for Sollas (1903) at the beginning of this century.

The problem of maintaining the parallelism of successive ground surfaces has been solved in two main ways. By one method the specimen is fed mechanically or by gravity against a revolving lap or grindstone, a micrometer sometimes being incorporated in the feed to determine the grinding interval (for small specimens: Tutton, 1894, 1922; Sollas, 1903; etc.; for large specimens: Sollas and Sollas, 1914; Olsen and Whitmore, 1944); or the specimen is fixed and the lap is raised against it (Wright, 1915). By the other method, the specimen is mounted on a hand-operated[1] tripod which slides over a plate carrying abrasive, the specimen either being centrally placed (Wülfing, 1890) or itself forming the third support of the tripod (Wülfing, 1901; Thomas and Campbell Smith, 1914; Caldwell, 1935). The general principles of construction embodied in these methods were first used by crystallographers and have been followed until recently by paleontologists. In the instruments for sectioning fossils described by Bulman (1927) and Simpson (1933), however, new principles are employed. In the first of these the specimen holder, together with the micrometer, slides in two horizontal parallel grooves over a levelled hone. In the second, improved by Zdanski (1938), the specimen is ground until it is flush with the end of a combined holder and micrometer.

The instrument here described is a combination of the large micrometer of Zdanski (1938) and the tripod with sliding specimen holder made by Fuess[2] (see Groth, 1885, fig. 621); a novel feature being the use of steel balls as rolling supports for the tripod. In this way are obtained free movement over the grinding plate, negligible abrasion of the supports, exceptional precision in the determination of the grinding interval, a fairly wide range in the size of specimen which can be accommodated, and easy conversion to mechanical grinding.

For grinding by hand, the instrument is used in conjunction with a plate covered by abrasive; for mechanical grinding, a rotating lap takes the place of the stationary plate. The following description applies particularly to hand grinding.

DESCRIPTION OF INSTRUMENT

The general assembly can be seen from the photographs reproduced in figure 1. The more important parts are the base plate *A*,

[1] Wülfing's (1901) instrument was adapted for mechanical operation by Königsberger (1908) and Hörner (1915). (See Rosenbusch, 1921, figs. 31, 32.)

[2] This instrument was perhaps designed by T. Liebisch, who is mentioned in a catalogue of the firm of R. Fuess dated 1891. Grodzinski (1942, fig. 71) attributes it to Wülfing.

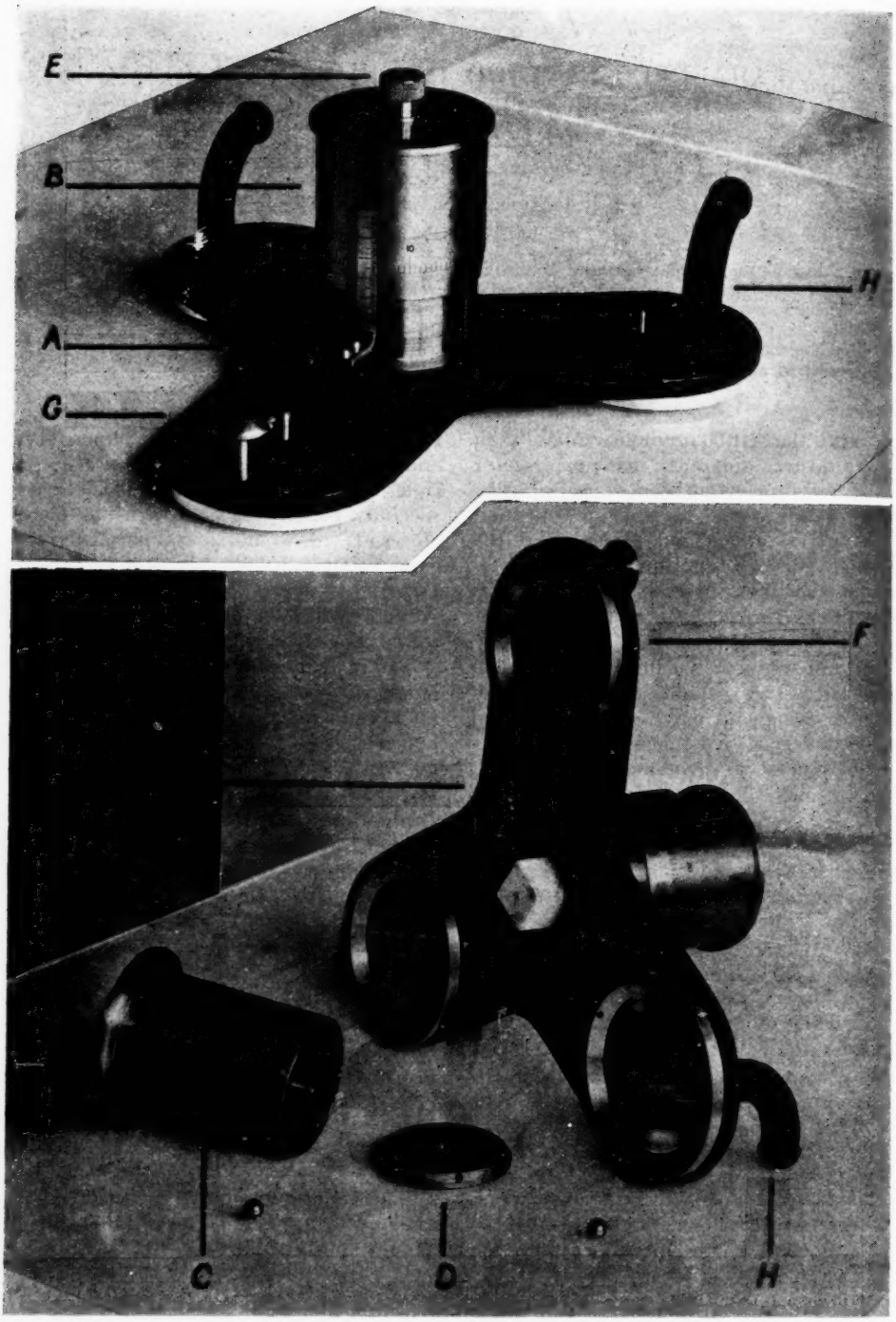


FIG. 1—The instrument is shown in the position for grinding (above) and tilted into the vertical position (below). A spare specimen disc and holder are shown. About one-quarter natural size. Photograph by M. G. Sawyers.

micrometer *B*, and the specimen holder *C*. The micrometer, which is rigidly attached to the base plate, consists of a wide cylinder with an external metric thread taking a thimble divided into 100 equal angular divisions which are read against a fixed millimeter scale. The thimble is advanced by 1/100 mm. (10μ) when displaced through one division. The micrometer acts as a guide for the cylindrical specimen holder, which slides freely inside it. The disc *D*, to which the specimen is cemented, can be firmly clamped to the lower end of the holder by a milled-headed rod *E* which screws into a blind tapping in the disc. A flange at the upper end of the holder comes to rest on the thimble when grinding is completed and acts as a stop. Disc, holder, and micrometer are kept in the same relative angular positions by slotted pins. The three corners of the base plate, the lower surface of which is machined, are supported by steel balls held in identical circular cages *F*. Each cage consists of a ring and thin disc, which can be renewed. When a specimen is not being ground the free movement of the balls within the cages and on the grinding plate allows the instrument to be moved at a touch. A suitable diameter for the steel balls is $\frac{5}{8}$ in. (1.6 cm.), but larger balls may be used if more clearance between the instrument and the grinding plate is required. To apply abrasive to the grinding plate and to detach the disc and specimen so that a record can be made of each ground surface, the instrument is raised by a knob *G* into a vertical position in which it is supported by two brackets *H*.

When grinding large specimens cylindrical weights can be inserted into the hollow specimen holder in order to increase the load.

The specimen discs are 7 cm. in diameter. A modified form for orientating specimens before or after grinding is shown in figure 2A. A solid brass segment *S*, to which the specimen is cemented, is rigidly united with a corresponding socket on the disc by a film of wax.[3] On warming the disc the segment becomes movable in the socket and the specimen can be orientated.

[3] A good wax for cementing specimens to the discs is "Ceresine" no. 5052 (made by Poth Hille, Ltd., London) which has a melting point of about 60°C. For joining the segment to the socket it is necessary to use a wax of lower melting point, e.g., paraffin wax.

HAND GRINDING

The grinding plate.—This is shown in figure 3. The abrasive powder is carried by a metal sheet laid over plate glass. Three

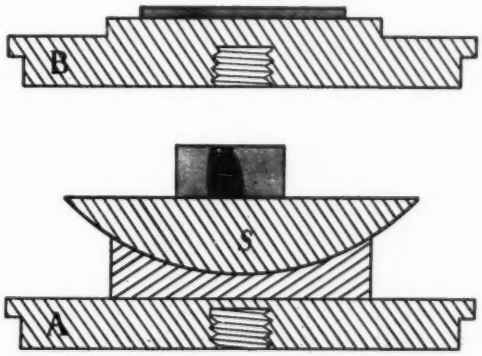


FIG. 2—Modified specimen discs in sectional view. *A*, with attachment for orientating the specimen; *B*, for cutting crystal plates.

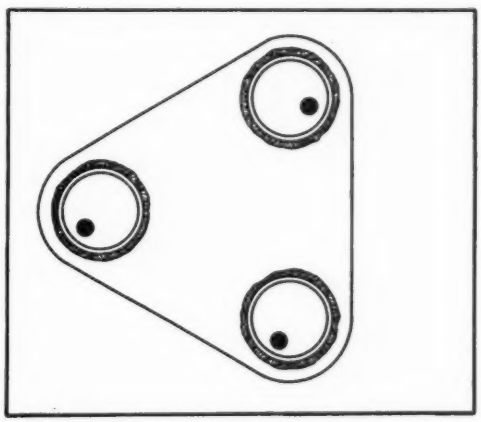


FIG. 3—Top view of grinding plate, much reduced.

metal rings attached to the sheet form cups for the steel balls and, by restricting the movement of the instrument, keep balls and cages free from abrasive.

The glass plate, about 40×45 cm., must be bedded down on a rigid support, for example, a slab of plaster of Paris 4 to 5 cm. thick, reinforced with sisal fiber or similar material. Lithographic sheet zinc about one-half millimeter thick is a good bearer

for the abrasive. It is fixed to the glass by waterproof adhesive tape along its edges. The metal rings which are the same size as, and accurately concentric with, the cages are attached to the metal sheet by a surrounding wall of plasticene. The cages should be lightly smeared with petroleum jelly.

For large specimens the cups cannot be used and the instrument is allowed to travel freely over a large zinc sheet laid on the glass to the grinding plate and a steel ball is introduced into each cup. To grind the specimen the instrument is held by the lifting knob and a bracket and moved in a circular path without applying downward pressure.

The micrometer is used in the same way as, for example, in Sollas's (1903) instrument, readings being taken when the ground surface is just out of frictional contact with the grinding plate.[4] The micrometer may be

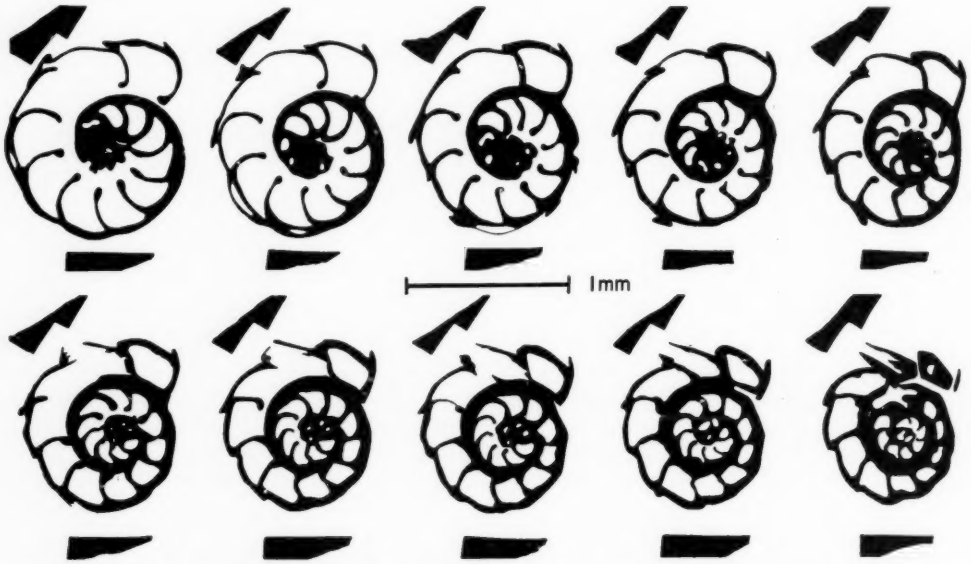


FIG. 4—Part of a continuous series of sections through a recent foraminifer ground at intervals of 10 microns. The black patches represent angles of cleavage cubes of galena for registering the sections. The specimen and cubes were embedded in perspex and ground with 600-mesh carborundum on plate glass. Drawings by camera lucida.

plate. Large and hard specimens may be ground more rapidly on a revolving lap (see below).

As abrasive the finer grades of carborundum and aloixite have proved satisfactory. The use of diamond powder rolled into the zinc sheet considerably reduces the time taken to grind hard specimens; a suitable grain size is 20 to 40 microns. Water alone or water to which some glycerine has been added are used as lubricants.

Operation.—The specimen—mounted, if necessary, in a block of plaster, etc.—is cemented with wax to one of the specimen discs which is then firmly clamped to the holder. Abrasive and lubricant are applied

set in advance to give fixed (usually equal) grinding intervals. Or the specimen may be ground until, by inspection, the desired new surface has been obtained: the thickness lost in grinding is then the difference between the micrometer readings for the new and old surfaces.

There are a number of methods of making permanent records of the ground surfaces of fossils (see Olsen and Whitmore, 1944; Butler, 1935; Sternberg and Belding, 1942); a method by which the histology is revealed

[4] It is often convenient, especially for hard specimens, to read the micrometer when contact is first lost with a particular part of the grinding plate.

being especially important for petrified plants (Walton, 1928). These records may be used to reconstruct the morphology of the fossils (Sollas, 1903; Pusey, 1939; etc.)

Cutting crystal plates.—Plates from crystals and other substances can be cut to a given thickness using the modified disc shown in figure 2B. When first used the surface of the raised part of the disc must be ground flat in the instrument so that the faces of the plates shall be strictly parallel. The crystal is cemented to this surface with wax and a face ground and polished. The specimen is then remounted with its polished face in contact with the disc. The micrometer is set to give a plate of the desired thickness, allowance being made for the thickness of the cementing film of wax. The parallel face of the plate is then ground and polished. A face may be polished by moving the instrument on the steel balls over a large piece of stretched billiard cloth, etc., loaded with the appropriate powder, the edges of the cloth being fastened to a square of plate glass by strips of waterproof adhesive tape. Alternatively, very fine grades of diamond powder may be used on the grinding plate.

Performance.—The consecutive sections of a recent foraminifer shown in figure 4 serve to illustrate the precision with which specimens can be ground by this instrument. The sections were taken at intervals of 10μ, measured by the micrometer, and the rather uniform gradation between them indicates that the intervals are, in fact, nearly equal. Hitherto, sectioning at such small regular intervals has only been possible with a microtome on relatively soft material.

When the specimen is ground on the metal sheet without the cups, the accuracy of grinding is but slightly reduced. Wear of the supports is negligible because the abrasive tends to be driven into the surfaces of the balls and cages. For the same reason the metal sheet wears very slowly. The parts liable to wear are readily replaced.

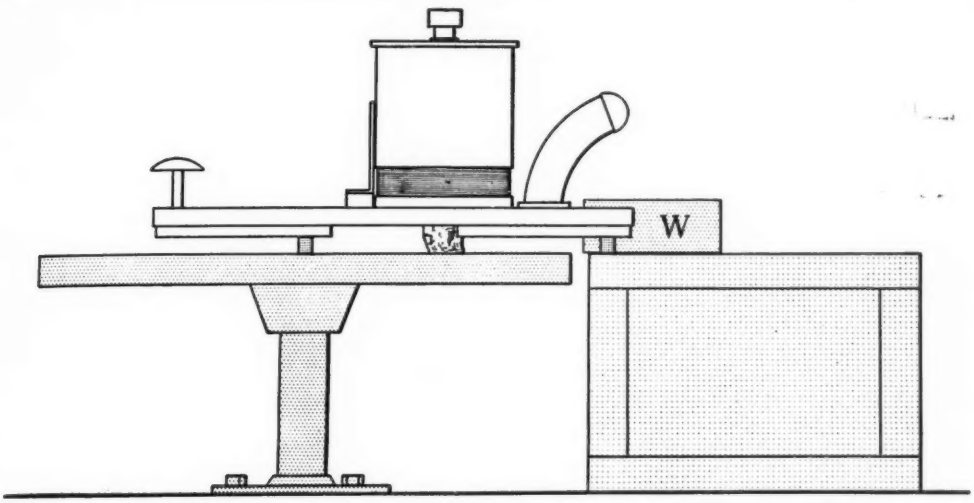


FIG. 5—The instrument set up for use in conjunction with a mechanically rotated lap.

MECHANICAL GRINDING

A simple method of using the instrument in conjunction with a mechanically rotated lap is shown in figure 5. The instrument stands over the lap on three fixed supports which take the place of the steel balls. One of these supports is a pin let into the center of the lap or of a metal disc laid over it. The two other supports are wood screws which project vertically from one side of a closed wooden box filled with sand to give it stability. The screws are carefully levelled so that the plane in which the tops of the supports lie is as nearly as possible parallel to the plane of the upper surface of the lap, since on this adjustment depends the accuracy with which specimens can be ground.

During grinding the instrument presses against a movable weight *W*. By altering the position of this weight for different specimens uneven wear of the lap is largely avoided. When tilted into the vertical position the instrument stands on the box beside the lap.

ACKNOWLEDGMENTS

Grateful acknowledgments are made to Mr. C. A. Duddles, Mr. C. F. Sayers and others for valuable ideas, and to Mr. R. S. Potter, who constructed the instrument, which owes much to his technical skill and advice.

My colleague, Dr. H. M. Muir-Wood, has kindly read the manuscript and tested the instrument.

REFERENCES

BULMAN, O. M. B., 1927, British dendroid graptolites, I: Palaeontographical Soc. Mon., vol. 79, pp. 1–28.

BUTLER, A. J., 1935, Use of cellulose films in palaeontology: Nature, vol. 135, p. 510.

CALDWELL, F. E. S., 1935, A simple method of taking serial sections: Geol. Mag., vol. 72, pp. 521–523.

GRODZINSKI, P., 1942, Diamonds and gem stone industrial production. N. A. G. Press, Ltd., London.

GROTH, P., 1885, Physikalische Krystallographie, 2nd ed. Wilhelm Engelmann, Leipzig.

KÖNIGSBERGER, J., 1908, Neue Apparate und Beobachtungsmethoden: Zentralblat. f. Min. etc., pp. 565–573.

OLSEN, F. R. and WHITMORE, F. C., JR., 1944, Machine for serial sectioning of fossils: Jour. Paleontology, vol. 18, pp. 210–215.

PUSEY, H. K., 1939, Methods of reconstruction from microscope sections: Royal Micr. Soc. Jour., vol. 59, pp. 232–244.

ROSENBUSCH, H., 1921, Mikroskopische Physiographie der petrographische wichtigen Mineralien, 5th ed., edited by E. A. Wülfing. E. Schweizerbart'sche Verlagsbuchhandlung (Erwin Nägele), Stuttgart.

SIMPSON, G. G., 1933, A simplified serial sectioning technique for the study of fossils: Am. Mus. Nat. History Novitates, no. 634, pp. 1–6.

SOLLAS, I. B. J., and SOLLAS, W. J., 1914, A study of the skull of *Dicynodon* by means of serial sections: Royal Soc. London Philos. Trans., ser. B, vol. 204, pp. 210–223.

SOLLAS, W. J., 1903, A method for the investigation of fossils by serial sections: Royal Soc. London Philos. Trans., ser. B, vol. 196, pp. 259–265.

STERNBERG, R. M., and BELDING, H. F., 1942, Dry-peel technique: Jour. Paleontology, vol. 16, pp. 135–136.

THOMAS, H. H., and CAMPBELL SMITH, W., 1914, An apparatus for cutting crystal-plates and prisms: Mineralog. Mag., vol. 17, pp. 86–96.

TUTTON, A. E. H., 1894, An instrument for grinding section-plates and prisms of crystals of artificial preparations accurately in the desired directions: Royal Soc. London Philos. Trans., ser. A, vol. 185, pp. 887–912.

——, 1922, Crystallography and practical crystal measurement. London, Macmillan and Company, Ltd.

WALTON, J., 1928, A method of preparing sections of fossil plants contained in coal balls or in other types of petrification: Nature, vol. 122, p. 571.

WRIGHT, F. E., 1915, A new crystal-grinding goniometer: Washington Acad. Sci. Jour., vol. 5, pp. 35–41.

WÜLFING, E. A., 1890, Ueber einen Apparat zur Herstellung von Krystallschliffen in orientirter Lage: Zeitschr. Krystallographie u. Mineralogie, vol. 17, pp. 445–459.

——, 1901, Ueber einen vereinfachten Apparat zur Herstellung orientirter Krystallschliffe: Neues Jahrb. f. Min. Geol. Paläont., vol. 2, pp. 1–22.

ZDANSKI, O., 1938, An improved apparatus for serial sectioning of fossils: Science, n.s., vol. 88, pp. 385–386.

JOURNAL OF PALEONTOLOGY, VOL. 24, NO. 6, PP. 699–745, NOVEMBER 1950

BIBLIOGRAPHY AND INDEX TO NEW GENERA, SPECIES AND VARIETIES OF FORAMINIFERA FOR THE YEAR 1949

HANS E. THALMANN
International Petroleum Consultants, Inc., Pasadena, California

ABSTRACT—The following bibliography lists for the year 1949, 350 papers devoted partly or exclusively to Foraminifera. One hundred and thirty-one titles are added for previous years.

The index to new genera, species and varieties (subspecies) of Foraminifera for the year 1949 records as new: two subfamilies, 28 genera, four subgenera, 625 species, 77 varieties, 28 nomina nova, 15 nomina nuda, 19 homonyms of which 11 have been changed during 1949 and 165 forms to which the nomenclature aperta was applied. For previous years are supplemented as new: five genera, 63 species, seven varieties, one nomen novum, six nomina nuda, three homonyms and ten forms with nomenclatura aperta.

The names of the following homonyms (1949) have not yet been changed.

Bolivina lobata Bermudez
Bolivina denticulata Bandy
Bolivina robusta Brady var. *pacifica* Boomgaart
Bolivina striata Hussey
Dorothia rotunda Boomgaart
Entosolenia iota Boomgaart
Nodosaria bradyi Boomgaart
Robulus virginianus Cushman and Cederstrom

References for the homonyms are given in the following index.

Acknowledgements.—The compiler is very much indebted for assistance given by the following persons: Dr. K. Asano (Tokyo), Dr. H. Bartenstein (Celle), Dr. S. Hanzawa (Tokyo), Mr. W. H. Heers (Washington, D. C.), Dr. H. Hiltermann (Hannover), Miss A. R. Messina (New York), Dr. C. D. Ovey (London), Dr. J. Sigal (Paris), Miss M. Siegrist (Washington), and Dr. M. Vasicek (Prague). Cordial thanks are expressed to all the authors who kindly furnished reprints of their papers.

BIBLIOGRAPHY FOR 1949

1. ABEELE, D. VAN DEN, *Lepidocyclina* from Rembang (Java) with description of *L. wanneri*, n. sp.: K. Nederl. Akad. Wetensch. Amsterdam Proc., vol. 52, no. 7, pp. 760–765, pl. 1, 3 text-figs.
2. ABRARD, R., FURON, R., MARIE, P. and SOYER, R., Le calcaire pisolithique de Vigny n'est pas une faciès de la Craie: Acad. sci. Paris Comptes rendus, vol. 228, pp. 189–190.
3. ABRARD, R., FURON, R., MARIE, P., and SOYER, R., Sur l'age du calcaire pisolithique de Vigny: ibid., vol. 228, pp. 758–760.
4. ALMELA, ANTONIO, La fauna del Eoceno inferior de Arén (Huesca): Inst. geol. min. España Notas y Comun., Madrid, no. 19, pp. 1–13, pl. 1.
5. ALVAREZ, MANUEL, JR., Notas sobre el Paleozoico mexicano: Asoc. Mexicana Geol. Petrol. Bol., vol. 1, no. 1, pp. 47–56, 1 map.
6. ARNOULD, M., Note sur le Pliocène de Menzel-Témine (Cap-Bon). Stratigraphie. Paléontologie.: Soc. Sci. Nat. Tunisie Bull., vol. 2, pp. 45–49, 1 fig., 1 table.
7. ASANO, KIYOSHI, New Miocene Foraminifera from Japan: Jour. Paleontology, vol. 23, pp. 423–430, 2 text-figs.
8. ASANO, KIYOSHI, Foraminifera from the Asagai formation (Tertiary) of Fukushima prefecture, Japan: ibid., vol. 23, pp. 473–478, 2 text-figs.
9. ASANO, KIYOSHI, The foraminiferal genus *Cruciloculina* d'Orbigny, 1839: ibid., vol. 23, pp. 479–480, pl. 80.
10. ASANO, KIYOSHI, Errata: ibid., vol. 23, p. 692.
11. ASANO, KIYOSHI, On the Miocene forms of *Cyclammina* from Japanese oil fields: Geol. Soc. Tokyo Jour., vol. 55, no. 640, pp. 1–4, 2 text-figs. In Japanese with summary in English (non vidi).
12. AVNIMELECH, M., Un niveau conglomératique dans la Turonien de la Palestine: Soc. géol. France Comptes rendus, pp. 204–205.
13. BANDY, ORVILLE L., Eocene and Oligocene Foraminifera from Little Stave Creek, Clarke County, Alabama: Bull. Am. Paleontology, vol. 32, no. 131, 211 pp., 27 pls., 1 map, 1 section, 1 table.
14. BANDY, ORVILLE L., New names for two spe-

cies of Foraminifera from the Little Stave Creek, Clarke County, Alabama: Jour. Paleontology, vol. 23, p. 440.
15. BANDY, ORVILLE L., Ontogenetic variation in *Eponides mexicanus* (Cushman) (Abstract): Geol. Soc. America Bull., vol. 60, p. 1949.
16. BANDY, ORVILLE L., *Textularia* vs. *Spiroplectammina:* The Micropaleontologist, vol. 3, no. 1, pp. 22–23.
17. BARNARD, TOM, An abnormal Chalk foraminifer: Geologists' Assoc. London Proc., vol. 60, pt. 4, pp. 284–287, 1 pl.
18. BARNARD, TOM, Foraminifera from the lower Lias of the Dorset coast: Geol. Soc. London Abstr. of Proc., no. 1448, pp. 49–50 (with discussion on pp. 50–53).
19. BARTENSTEIN, HELMUT, Die Bedeutung der Foraminiferen für die Wissenschaft und Praxis: Urania, vol. 12, no. 3, pp. 98–102, 8 text-figs.
20. BARTENSTEIN, HELMUT, Stratigraphische und ökologische Folgerungen aus dem Auftreten von Ostracoden und Foraminiferen im produktiven Ruhr-Oberkarbon: Neues Jahrb. f. Min. etc., Monatshefte, Jahrg. 1949, Abt. B, pp. 60–64, 1 table.
21. BARTENSTEIN, HELMUT, *Neoflabellina, nomen novum* pour *Flabellina* d'Orbigny, 1839 (Foraminifera): Soc. géol. France Comptes rendus, pp. 164–165, 1 table.
22. BARTENSTEIN, HELMUT, Ein neues Leitfossil in der nordwestdeutschen Oberkreide. *Cyclocibicides triebeli* n. sp. (For.): Senckenbergiana, vol. 30, nos. 4–6, pp. 213–216, 5 text-figs.
23. BARTENSTEIN, H., and BRAND, H., New genera of Foraminifera from the Lower Cretaceous of Germany and England: Jour. Paleontology, vol. 23, pp. 669–672, 10 text-figs.
24. BATTEY, M. H., The geology of the Tuakau-Mercer area, Auckland: Royal Soc. New Zealand Trans. and Proc., vol. 77, pt. 4, pp. 429–455, 2 figs., 4 pls. (Note: Checklist of Foraminifera by H. J. FINLAY).
25. BEETS, C., On the occurrence of *Biplanispira* in the uppermost Eocene (Kyet-U-Blok Band) of Burma: Geol. en Mijnbouw, n.s., vol. 11, pp. 229–232, 1 text-fig.
26. BELLEN, R. C. VAN, (Activities in micropaleontology) The Near East: The Micropaleontologist, vol. 3, no. 2, pp. 17–18.
27. BELLEN, R. C. VAN, (Activities in micropaleontology) The Near East: ibid., vol. 3, no. 4, pp. 13–14.
BENEŠ, K., see RUZICKA, B., and BENEŠ, K.
28. BENTZ, A. (editor), Erdöl und Tektonik in Nordwestdeutschland. Hannover-Celle, Amt f. Bodenforsch., 387 pp., 15 pls., figs.
29. BERMUDEZ, PEDRO J., *Pavoninoides*, a new genus of the Miliolidae from Panama: Cushman Lab. Foram. Research Contr., vol. 25, p. 58, 1 text-fig.
30. BERMUDEZ, PEDRO J., Tertiary smaller Foraminifera of the Dominican Republic: ibid., Spec. Pub. 25, 322 pp., 26 pls., 6 text-figs. (maps), 1 range chart.
BERMUDEZ, PEDRO J., see CUSHMAN, J. A., and BERMUDEZ, P. J.
31. BETTENSTAEDT, FRANZ, Paläogeographie des nordwestdeutschen Tertiär mit besonderer Berücksichtigung der Mikropaläontologie: in BENTZ, A., ut supra (no. 28), pp. 143–172, 6 text-figs.
32. BLUMENTHAL, MOR. M., and GÖKSU, EKREM, Akseki civarindaki daglarda boksit zuhurati, bunlarin jeolojik durumu ve jenesi hakkinda izahat-Die Bauxit-Vorkommen der Berge um Akseki. Erörterungen über ihre geologische Position, Ausmasse und Genese: Maden tetkik ve Arama Enstit. Yayinlar., Veröff. Inst. Lagerstättenforsch. Türkei, (B), no. 14, 59 pp., 16 photos.
33. BOND, GEOFFREY, The lower Carboniferous reef limestones of Cracoe, Yorkshire: Geol. Soc. London Quart. Jour., vol. 105, pt. 2, no. 418, 157–188, pl. 7, 4 text-figs.
34. BONI, A., Ritrovamento di una brecciola a corallinacea nelle argille scagliose della zona di Montalto pavese: Univ. Pavia, Atti Ist. Geol., vol. 3, pp. 83–90, 1 pl.
35. BOOMGART, LUBBARTUS, Smaller Foraminifera from Bodjonegoro (Java): Proefschr. (Thesis) Rijks-Univ. Utrecht, 175 pp., 14 pls., 1 table of distribution, 6 tables, 2 text-figs.
36. BRAND, ERICH, Neue Ergebnisse zur mikropaläontologischen Gliederung des nordwestdeutschen Dogger und Valendis: in BENTZ, A., ut supra (no. 28) pp. 335–348, pls. 10–14, 5 text-figs., 1 table.
BRAND, E., see BARTENSTEIN, H., and BRAND, E.
37. BRÖNNIMANN, PAUL, Pflanzenbewohnende tropische Foraminiferen nebst Beschreibung von *Cymbalopora tobagoensis* n. sp.: Naturf. Gesell. Basel Verh., vol. 60, pp. 179–185, 2 text-figs.
38. BRÖNNIMANN, PAUL, (Activities in micropaleontology) West Indies: The Micropaleontologist, vol. 3, no. 1, pp. 4–5.
39. BRÖNNIMANN, PAUL, Notes on the ecologic interpretation of fossil *Globigerina* oozes from the West Indies: ibid., vol. 3, no. 2, pp. 23–27.
40. BROTZEN, FRITZ, (Activities in micropaleontology) Scandinavia: ibid., vol. 3, no. 2, p. 16.
41. BROTZEN, FRITZ, Correction of genotype (for *Reinholdia*): ibid., vol. 3, no. 2, p. 30.
42. BROTZEN, FRITZ, Zur Gliederung der oberen Kreide in Skandinavien: Geol. fören. Förh., vol. 71, pp. 181–183.
43. BROTZEN, FRITZ, Joseph A. Cushman: ibid., vol. 71, p. 312.
BROWNE, RICHARD VERNON, see HENSON, F. R. S. and others.
44. BRÜNNER, G., Kombinierte Beleuchtung in der Mikroskopie und Mikrophotographie: Mikrokosmos, Stuttgart, vol. 38, pp. 207–209, 2 figs.
45. BURCK, H. D. M., Het geologisch profiel Breukelen-Deventer: Geol. Stichting Haarlem, Meded., n.s., no. 3, pp. 5–17, 5 figs., 1 section.

46. CAROZZI, ALBERT, Rapports entre microfaune benthique et microfaune pélagique: Archives sci. (Genève), vol. 2, pp. 169–171.
47. CAROZZI, ALBERT, Interprétations des séries sédimentaires: Le Crétacé supérieur de Châtelard-en-Bauges (Savoie): ibid., vol. 2, pp. 171–174, 1 text-fig.
48. CAROZZI, ALBERT, Sur une particularité des calcaires pseudo-oolithiques de l'Urgonien (nappe de Morcles): ibid., vol. 2, pp. 348–350.
49. CAROZZI, ALBERT, Interprétations des séries sédimentaires: Le Berriasien et le Valanginien schisteux de La Giéttaz (nappe de Morcles-Aravis): ibid., vol. 2, pp. 350–354, 1 text-fig.
50. CAROZZI, ALBERT, Interprétations des séries sédimentaires: Le Valanginien calcaire et l'Hauterivien de Pas-de-Sales (nappe de Morcles-Aravis): ibid., pp. 354–359, 1 text-fig.
51. CAROZZI, ALBERT, Interprétations des séries sédimentaires: Le Valanginien calcaire et l'Hauterivien de la Pointe des Avaudrues (nappe de Morcles-Aravis): ibid., vol. 2, pp. 359–362, 1 fig.
52. CAROZZI, ALBERT, Interprétations des séries sédimentaires: Le Cénomanien de la nappe de Morcles dans les Dents-Blanches de Champéry et les Dents du Midi: ibid., vol. 2, pp. 544–549, 2 figs.
CAROZZI, ALBERT, see PAREJAS, E., and CAROZZI, A.
53. CASTANY, G., L'Oligocène marin de la Tunisie orientale: Soc. géol. France Comptes rendus, pp. 359–360.
CEDERSTROM, D. J., see CUSHMAN, J. A., and CEDERSTROM, D. J.
54. CHAVAN, A., Sur l'interprétation du Paléocène africain: Soc. géol. France Comptes rendus, pp. 381–382.
CHRONIC, R. JOHN, see NEWELL, N. D., and others.
55. CHURCH, CLIFFORD C., Appendix (on Foraminifera in Salton Sea, California): in ROGERS, F. L., Three new subspecies of *Balanus amphitrite* from California: Jour. Entomology and Zoology, vol. 41, no. 2, reprint, p. 11.
56. CITA, MARIA BIANCA, L'affioramento neocretaceo di Sirmione e la sua microfauna: Riv. ital pal. e Strat., vol. 55, no. 4, pp. 121–134, pl. 4, 3 text-figs.
57. CIZANCOURT, MARIA DE, (Activities in micropaleontology) France; The Micropaleontologist, vol. 3, no. 1, p. 9.
58. CIZANCOURT, MARIA DE, (Activities in micropaleontology) France: ibid., vol. 3, no. 3, pp. 4–5.
59. CIZANCOURT, MARIA DE, (Activities in micropaleontology) France: ibid., vol. 3, no. 4, pp. 7–8.
60. CIZANCOURT, MARIA DE, Bibliography (of French micropaleontological literature): ibid., vol. 3, no. 1, pp. 25–28.
61. CIZANCOURT, MARIA DE, and FRIZZELL, DON L., *Ferayina* in the middle Eocene of Venezuela (Foraminifera, Rotaliidae, Chapmanininae): Jour. Paleontology, vol. 23, pp. 496–497, pl. 81.
62. COLOM, G., La geologia del Cabo Pinar, Alcudia (Mallorca): Real Soc. España Hist. Nat.. Vol., tomo extraord., pp. 361–389, 7 text-figs.
63. COLOM, G., (Activities in micropaleontology) Spain and Portugal: The Micropaleontologist, vol. 3, no. 4, pp. 12–13.
64. CRESPIN, IRENE, (Activities in micropaleontology) Australia: ibid., vol., 3, no. 1, p. 18.
65. CRESPIN, IRENE, (Activities in micropaleontology) Australia and New Zealand: ibid. vol. 3, no. 4, pp. 16–17.
66. COLE, W. STORRS, Upper Eocene larger Foraminifera from the Panama Canal Zone: Jour. Paleontology, vol. 23, pp. 267–275, pls. 52–55.
67. CUSHMAN, JOSEPH A., (Activities in micropaleontology) The Cushman Laboratory: The Micropaleontologist, vol. 3, no. 1, p. 3.
68. CUSHMAN, JOSEPH A., Recent Belgian Foraminifera: Inst. Roy. Sci. Nat. Belgique Mém., no. 111, pp. 1–59, pls. 1–10, 3 tables.
69. CUSHMAN, JOSEPH A., The foraminiferal fauna of the Upper Cretaceous Arkadelphia marl of Arkansas. Illustrations and description of Foraminifera from the Deaderick Collection in the U. S. National Museum: U. S. Geol. Survey Prof. Paper 221-A, 17 pp., 4 pls.
70. CUSHMAN, JOSEPH A., Recent literature on the Foraminifera: Cushman Lab. Foram. Research Contr., vol. 25, pp. 22–24.
71. CUSHMAN, JOSEPH A., and BERMUDEZ, PEDRO J., Some Cuban species of *Globorotalia:* ibid., vol. 25, pp. 26–45, pls. 5–8, 1 table.
72. CUSHMAN, JOSEPH A., and CEDERSTROM, D. J., An upper Eocene foraminiferal fauna from deep wells in York County, Virginia: Virginia Geol. Survey Bull. 67, 1945 (delivered by printer April 15, 1949), 58 pp., 6 pls.
73. CUSHMAN, JOSEPH A., and GLAZEWSKI, K., Upper Jurassic Foraminifera from the Nizniov limestone of Podole, Poland: Cushman Lab. Foram. Research Contr., vol. 25, pp. 1–11, pls. 1–3, 1 map.
74. CUSHMAN, JOSEPH A., STEWART, ROSCOE E., and STEWART, KATHERINE C., Upper Eocene Foraminifera from the Toledo formation, Toledo County, Oregon: Oregon Dept. Geol. Min. Industr. Bull. 36, pt. 6, pp. 126–146, pls. 14–16.
75. CUSHMAN, JOSEPH A., STEWART, ROSCOE E., and STEWART, KATHERINE C., Quinault Pliocene Foraminifera from western Washington: ibid., Bull. 36, pt. 7, pp. 147–164, pls. 17, 18.
76. CUSHMAN, JOSEPH A., and STONE, BENTON, Foraminifera from the Eocene Chacra formation of Peru: Cushman Lab. Foram. Research Contr., vol. 25, pp. 49–58, pls. 9, 10.
77. CUSHMAN, JOSEPH A., and STONE, BENTON, Foraminifera from the Eocene Verdun for-

mation of Peru: ibid., Contr. vol. 25, pp. 73–84, pls. 13, 14.
78. CUSHMAN, JOSEPH A., and TODD, RUTH, The genus *Sphaeroidina* and its species: ibid., Contr., vol. 25, pp. 11–21, pls. 3, 4.
79. CUSHMAN, JOSEPH A., and TODD, RUTH, Species of the genera *Allomorphina* and *Quadrimorphina:* ibid., Contr., vol. 25, pp. 59–72, pls. 11, 12.
80. CUSHMAN, JOSEPH A., and TODD, RUTH, Species of the genus *Chilostomella* and related genera: ibid., Contr., vol. 25, pp. 84–89, pls. 15, 16.
81. CUVILLIER, J., Présence du Paléocène en Haute-Égypte: Soc. géol. France Comptes rendus, pp. 268–269.
82. CUVILLIER, J., DUPOUY-CAMET, J. and SZAKALL, V., L'Yprésien marin autour du bombement crétacé de Roquefort-des-Landes: ibid., Comptes rendus, pp. 60–62.
83. CUVILLIER, J., DUPOUY-CAMET, J., and SZAKALL, V., Le Miocène marin de Saubrigues et de St-Jean-de-Marsacq (Landes). Observations à la note de A. MAGNÉ et M. VIGNEAUX): ibid., Comptes rendus, pp. 95–97.
84. CUVILLIER, J., and SZAKALL, V., Foraminifères d'Aquitaine. Première Partie (Reophacidae à Nonionidae). Soc. Nation. Pétrol. d'Aquitaine, Toulouse (Imprimerie F. Boisseau), 113 pp., 32 pls.
85. DAM, A. TEN, (Activities in micropaleontology) North Africa: The Micropaleontologist, vol. 3, no. 1, p. 15.
86. DAM, A. TEN, (Activities in micropaleontology) North Africa: ibid., vol. 3, no. 3, p. 7.
87. DAM, A. TEN, Dr. Joseph A. Cushman: Geol. en Mijnbouw, vol. 11, n.s., p. 302.
88. DAM, A. TEN, and SIGAL, J., Sur une espèce nouvelle du genre de foraminifères *Biglobigerinella* Lalicker 1948: Soc. géol. France Comptes rendus, pp. 234–235, 3 text-figs.
89. DAVIES, L. M., *Ranikothalia* in East and West Indies: Geol. Mag., vol. 86, pp. 113–116.
90. DAVIS, A. G., Index Foraminifera of the Chalk: ibid., vol. 86, p. 71.
91. DIAZ LOZANO, ENRIQUE, and ESCALANTE MENDOZA, RAUL, Apendice paleontologico del reconocimiento geologico de los estados de Puebla, Guerrera y Oaxaca: Asoc. Mexic. Geol. Petrol. Bol., vol. 1, pp. 152–156.
92. DIXON, E. E. L., Dr. R. L. Sherlock: Geol. Assoc. London Proc., vol. 60, pp. 84–86.
93. DUBOURDIEU, G., and SIGAL, J., Notes stratigraphiques et paléontologiques sur la région du Dj. Ouenza, Algérie. (Aptien, Albien, Cénomanien): Soc. géol. France Bull., sér. 5, vol. 19, pp. 205–221, 2 text-figs., pl. 6.
94. DUIJN, C. VAN, JR., A photomicrographic stand for use with twin-lens reflex cameras: The Microscope, London, vol. 7, pp. 217–218, 1 text-fig.
DUNAVEN, RUTH REECE, see: THOM, E. M. and others.
DUPOUY-CAMET, J., see CUVILLIER, J. and others.
95. DURAND, SUZANNE, Yprésien fossilifère et Lutétien aux environs de Port-Louis (Morbihan): Acad. Sci. Paris Comptes rendus, vol. 229, pp. 230–232.
96. DUSENBURY, A. N., JR., (Activities in micropaleontology) Venezuela: The Micropaleontologist, vol. 3, no. 2, pp. 6–8.
97. DUSENBURY, A. N., JR., and WOLCOTT, P. P., Rocas metamorficas cretacicas en la Cordillera de la Costa de Venezuela: Asoc. Venez. Geol. Min. y Petr. Bol., vol. 1, pp. 17–26, 1 map, 1 table.
98. EARLAND, A., Obituary: Joseph Augustine Cushman (January 31, 1881–April 16, 1949): Royal Micr. Soc. Jour., ser. 3, vol. 69, pp. 243–244.
99. ELLIS, BROOKS F., A new mounting device: The Micropaleontologist, vol. 3, no. 1, pp. 23–25, 3 text-figs.
100. ELLIS, BROOKS F., Models of Foraminifera: ibid., vol. 3, no. 4, pp. 22–23, 2 text-figs.
101. ELLIS, BROOKS F., Micro-fossil clearing house (abstract): Ann. Meeting AAPG, SEPM, and SEG, St. Louis, Program, p. 34.
102. ELLIS, BROOKS F., and MESSINA, ANGELINA R., Catalogue of Foraminifera, Supplement for 1949, no. 1: Am. Mus. Nat. History Spec. Publ., 793 pp., 471 illustr.
103. ELLIS, BROOKS F., and MESSINA, ANGELINA R., Catalogue of Foraminifera, Supplement for 1949, no. 2: ibid., 787 pp., 399 illustr.
104. ELLIS, BROOKS F., and MESSINA, ANGELINA R., Catalogue of Foraminifera, Supplement for 1949, no. 3: ibid., Spec. Publ., 813 pp., illustr.
ELMS, MORRIS A., see GOLDICH, S. S., and ELMS, M. A.
105. EMILIANI, CESARE, Studio micropaleontologico di una serie Calabriana: Riv. Ital. Pal. Strat., vol. 55, fasc. 1, pp. 1–15, pls. 1, 2.
106. ERGUVANLI, K., Étude géologique de l'île Imrali. (Imrali adasimin jeolojisi): Geol. Soc. Turkey Bull., vol. 2, no. 1, pp. 118–125, 2 text-figs.
ESCALANTE MENDOZA, RAUL, see DIAZ LOZANO, E., and ESCALANTE MENDOZA, R.
107. FEUGUEUR, L., Sur la géologie du massif de Plate (Haute-Savoie): Soc. géol. France Bull., sér. 5, vol. 19, pp. 629–639, 2 text-figs.
108. FINLAY, H. J., Notes on the microfauna from hill one-half mile southeast of Lewin's farmhouse, one and one-half miles northeast of Paraparaumu: New Zealand Jour. Sci. Technol. (B), vol. 30, no. 2, pp. 82–83.
FINLAY, H. J., see BATTEY, M. H.
FINLAY, H. J., see WELLMAN, H. W.
109. FRIZZELL, DON L., Rotaliid Foraminifera of the Chapmanininae: their natural distinction and parallelism to the *Dictyoconus* lineage: Jour. Paleontology, vol. 23, pp. 481–495, 20 text-figs.
110 FRIZZELL, DON L., Flat filing cabinets for cardboard micro-slides: The Micropaleontologist, vol. 3, no. 2, p. 30.

111. FRIZZELL, DON L., and KEEN, A. MYRA, On the nomenclature and generic position of *Nautilus beccarii* Linné (Foraminifera, "Rotaliidae"): Jour. Paleontology, vol. 23, pp. 106–108.
FRIZZELL, DON L., see CIZANCOURT, M. DE, and FRIZZELL, D. L.
112. FURON, R., Sur le Paléocène africain: Soc. géol. France Comptes rendus, pp. 312–314.
FURON, R., see ABRARD, R., and others.
113. FURRER, MAX, Der subalpine Flysch nördlich der Schrattenfluh, Entlebuch (Kt. Luzern): Eclogae geol. Helvetiae, vol. 42, no. 1, pp. 111–154, 11 text-figs., pl. 11.
114. GERANZANI, C. S., Osservazioni stratigrafiche sul Cretacico superiore dei dintorni di Nerone (Como): Riv. Ital. Pal. Strat., vol. 55, pp. 78–81.
115. GIGNOUX, MAURICE, Rapport sur l'attribution du Prix Fontannes à M. Jacques Flandrin: Soc. géol. France Comptes rendus, pp. 193–195.
116. GILL, W. D., On the foraminifer *Dictyoconoides cooki* (Carter): Leeds Phil. Soc Proc., vol. 5, pp. 174–182, pls. 8–10.
117. GLAESSNER, MARTIN F., Foraminifera of Franciscan (California): Am. Assoc. Petroleum Geologists Bull., vol. 33, pp. 1615–1617.
GLAZEWSKI, K., see CUSHMAN, J. A., and GLAZEWSKI, K.
GOHARA, YASUMA, see TOKUNAGA, S., and others.
GÖKSU, EKREM, see BLUMENTHAL, M. M., and GÖKSU, E.
118. GOLDICH, SAMUEL S., and ELMS, MORRIS A., Stratigraphy and petrology of the Buck Hill quadrangle, Texas: Geol. Soc. America Bull., vol. 60, pp. 1133–1182, 6 figs., 6 pls.
119. GRAHAM, JOSEPH J., A note on the occurrence of microfossils in the matrix of an Upper Cretaceous plesiosaur from Lake Waco, McLennan County, Texas: The Micropaleontologist, vol. 3, no. 3, p. 13.
120. GRAHAM, JOSEPH J., Occurrence of a questionable *Elphidium* in the early Tertiary of California (Abstract): Geol. Soc. America, Cordill. Sect., Semicentennial Meeting, 1899–1949, Berkeley, Calif., Program, p. 28.
121. GRAY, KENNETH WASHINGTON, A tectonic window in south-western Iran: Geol. Soc. London Quart. Jour., vol. 105, pt. 2, no. 418, pp. 189–223, pls. 8–10, 4 text-figs.
122. GRILL, R., (Activities in micropaleontology) Austria: The Micropaleontologist, vol. 3, no. 2, pp. 12–13.
123. GRIMSDALE, T. F., (Activities in micropaleontology) The Near East: ibid., vol. 3, no. 1, p. 16.
124. GRIMSDALE, T. F., How they do vary: ibid., vol. 3, no. 1, p. 22.
125. GROHSKOPF, J. P., and MCCRACKEN, E., Insoluble residues of some Paleozoic formations of Missouri: their preparation, characteristics and application: Missouri Geol. Survey Rept. Inv. 10, 39 pp., 11 pls.
126. GUZIK, K., and POZARYSKI, W., Biecz anticline (middle Carpathians): Panstw. Inst. Geol. Biul., no. 53, pp. 5–33, pl. 1 (Polish with English translation).
127. GUZMAN, EDUARDO J., New petroleum development by Petroleos Mexicanos in northeastern Mexico: Am. Assoc. Petroleum Geologists Bull., vol. 33, pp. 1351–1384, 14 figs., 1 table.
128. HANZAWA, SHOSHIRO, *Borelis philippinensis*, n. sp. from Luzon, P.I.: Japan. Jour. Geology and Geography, vol. 21, pp. 155–157, pl. 4, 2 tables.
129. HANZAWA, SHOSHIRO, A new type of the fusulinid Foraminifera from Central Japan: Jour. Paleontology, vol. 23, pp. 205–209, pl. 43, 3 figs.
130. HECHT, F. E., The stratigraphic importance of faunal pictures: The Micropaleontologist, vol. 3, no. 1, pp. 20–21.
131. HENBEST, LLOYD G., (Activities in micropaleontology) Eastern United States: ibid., vol. 3, No. 3, pp. 3–6.
132. HENBEST, LLOYD G., Significance of explosive evolution for diastrophic division of earth history: Geol. Soc. America Ann. Meeting, El Paso, Texas, Program, Abstracts, pp. 38–39.
133. HENSON, F. R. S., Recent publications on larger imperforate Foraminifera of the Middle East: Annals and Mag. Nat. History, ser. 12, vol. 2, pp. 173–177.
134. HENSON, F. R. S., Observations on Cretaceous and Tertiary reef formations and associated sediments in Middle East (abstract): Ann. Meeting AAPG, SEPM, and SEG, St. Louis, Program, pp. 15–16.
135. HENSON, FRANCIS ROGER SPENCER, BROWNE, RICHARD VERNON, and MCGINTY, JAMES, A synopsis of the stratigraphy and geological history of Cyprus: Geol. Soc. London Quart. Jour., vol. 105, pp. 1–41, pls. 1, 2, 1 table.
136. HILTERMANN, HEINRICH, Die wichtigsten Ergebnisse der mikropaläontologischen Arbeiten von Nordwestdeutschland: in BENTZ, A., ut supra, (no. 28), pp. 326–334, pls. 6–9, 3 text-figs.
137. HILTERMANN, HEINRICH, Dr. Joseph Cushman: Erdoel und Kohle, vol. 2, pp. 535–536.
138. HILTERMANN, HEINRICH, Klassifikation der natürlichen Brackwässer: ibid., vol. 2, pp. 4–8, 8 text-figs.
139. HILTERMANN, HEINRICH: (Activities in micropaleontology) Germany: The Micropaleontologist, vol. 3, no. 2, pp. 14–15.
140. HOARE, CECIL A., and OVEY, C. D., Protozoa: Zool. Rec., vol. 48, sect. 2, 1947, London, October 1949, 85 pp.
141. HOFKER, JAN, On *Hagenowella* and a new species: Jour. Paleontology, vol. 23, pp. 431–435, 4 text-figs.
142. HOFKER, JAN, On Foraminifera from the upper Senonian of south Limburg (Maestrichtien): Inst. Roy. Sci. Nat. Belgique Mém., no. 112, 69 pp., 23 text-figs.

HOOKER, MARJORIE, see THOM, E. M., and others.
143. HUCKE, K., Mikropaläontologie auf neuen Wegen: Mikrokosmos, Stuttgart, vol. 38, pp. 193–197, 3 text-figs.
144. HUFF, K. F., Sedimentos del Jurasico superior y Cretacico inferior en el este del Peru: Soc. Geol. del Peru, vol. Jubil. XXV Anivers., pt. 2, fasc. 15, 10 pp., 4 pls.
HUPE, P., see RECEVEUR, Mlle., and others.
145. HUSSEY, KEITH M., Louisiana Cane River Eocene Foraminifera: Jour. Paleontology, vol. 23, pp. 109–144, pls. 25–29, 1 correlation table.
IDA, KAZUYOSHI, see KANEHARA, K. and others.
146. ISRAELSKY, MERLE C., Oscillation chart: Am. Assoc. Petroleum Geologists Bull., vol. 33, pp. 92–98, 3 text-figs., 1 chart.
147. ISRAELSKY, MERLE C., Names of some subsurface stratigraphic units in Texas: ibid., vol. 33, pp. 1904–1907.
ISHIWADI, YASUFUMI, see KANEHARA, K. and others.
IZGI, MEHLIKA, see TASMAN (Mrs.), MEHLIKA IZGI.
148. JOHNSON, J. HARLAN, An introduction to the study of organic limestones: Colorado School of Mines Quart., vol. 44, no. 4, 138 pp., 61 pls.
149. JUNG, JEAN, Jacques de Lapparent 1883–1948: Soc. géol. France Bull., ser 5, vol. 19, pp. 343–354, 1 portrait.
150. K., A., Mikhail Dimitrievitch Zalessky: Geol. Soc. London Quart. Jour., vol. 104, pt. 3, no. 415, pp. xlii–xliv.
151. KANEHARA, KINJI, and others: Natural gas in the vicinity of Mobara, Chiba-ken: Japan. Assoc. Petrol. Technologists, vol. 14, pp. 245–274, 2 maps, 6 tables. (In Japanese with summary in English).
KEEN, A. MYRA, see FRIZZELL, D. L., and KEEN, A. M.
152. KIREEVA, G. D., Stratigraphy of the lower part of the Middle Carboniferous in the pre-Uralian region of Molotov: Akad. Nauk S.S.S.R., Izv., ser. geol. no. 2, pp. 77–92, 1 fig. (In Russian).
153. KOECHLIN, E., Versteinerungen des Jura: Prisma (Frauenfeld), vol. 4, pp. 127–129, 7 photos.
154. KOKOSZYNSKA, B., Stratigraphy of the Lower Cretaceous in the northern Flysch Carpathians: Service. géol. Pologne Travaux, vol. 6, pp. 1–99, pls. 1–5. (In Polish with summary in English).
155. KUGLER, H. G., Alfred Senn (1899–1949): Am. Assoc. Petroleum Geologists Bull., vol. 33, pp. 1637–1638, 1 photo.
156. KUHN, CHR., Aus dem Leben Fritz Richard Schaudinns: Stuttgart, (Georg Thieme), 67 pp., 12 figs.
157. KUHN, OSKAR, Lehrbuch der Paläozoologie: Stuttgart (Schweizerbart), 326 pp., 224 figs. (Foraminifera: pp. 9–17, figs. 3–7).
KUWANO, YUKIO, see TOKUNAGA, S. and others.
158. Laboratory Staff, Joseph A. Cushman, 1881–1949: Cushman Lab. Foram. Research Contr., vol. 25, p. 25.
159. LADD, HARRY S., and others, Report of the Committee on a Treatise on marine ecology and paleontology 1948–1949: Nat. Research Council, Washington D.C., Div. Geol. and Geogr., Appendix 5, 121 pp.
160. LALICKER, CECIL G., Foraminifera of Ellis formation at type locality (Abstract): Ann. Meeting AAPG, SEPM, and SEG, St. Louis, Program, p. 35.
161. LALICKER, CECIL G., (Activities in micropaleontology) United States: Mid-Continent: The Micropaleontologist, vol. 3, no. 1, p. 2.
162. LALICKER, CECIL G., (Activities in micropaleontology) United States: Mid-Continent: ibid., vol. 3, no. 3, pp. 1–2.
163. LANG, W. D., Discussion (on paper by T. BARNARD on lower Lias Foraminifera of the Dorset Coast): Geol. Soc. London Abstr. Proc., no. 1448, pp. 50–51.
164. LAYER, D. B., and others, Leduc oil field, Alberta, a Devonian coral-reef discovery: Am. Assoc. Petroleum Geologists Bull., vol. 33, pp. 572–602, 2 pls., 8 figs.
165. LECALVEZ, YVONNE, Révision des Foraminifères lutétiens du bassin de Paris. II. Rotaliidés et familles affines: Ministr. Industr. et Commun. France, Services carte géol. détailée de la France Mém., 54 pp., 6 pls.
166. LEFAVRAIS, A., MARIE, P., and RICOUR, J., Travaux d'aménagement récents de l'usine hydroélectrique de Bioge (Haute-Savoie): Soc. géol. France Comptes rendus, p. 257, 1 text-fig.
167. LEROY, L. W., Chapter 3: Subsurface laboratory methods. Micropaleontological analysis: Colorado School of Mines Quart., vol. 44, no. 3, pp. 58–86. pls. 1–3, text-figs.
168. LEROY, L. W., Stratigraphic and micropaleontologic analysis of the Maqfi section, Farafra Oasis, western desert of Egypt (abstract): Geol. Soc. America Bull., vol. 60, no. 12, pt. 2, p. 1962.
169. LIPINA, O. A., Distribution of the smaller Foraminifera in the different facies of the Upper Carboniferous and Artinskian sediments in the Bashkirian massifs: Akad. Nauk S.S.S.R., Izv., ser. geol., no. 3, pp. 50–68, 6 figs. (In Russian).
170. LOEBLICH, ALFRED R., JR., and TAPPAN, HELEN, New Kansas Lower Cretaceous Foraminifera: Washington Acad. Sci. Jour., vol. 39, pp. 90–92.
171. LOEBLICH, ALFRED R., JR., and TAPPAN, HELEN, Foraminifera of the Walnut formation (Lower Cretaceous) of northern Texas and southern Oklahoma: Jour. Paleontology, vol. 23, pp. 245–266, pls. 46–51.
172. LOWMAN, SHEPARD W., Sedimentary facies of Gulf Coast (abstract): Ann. Meeting AAPG., SEPM, and SEG., St. Louis, Program, p. 26.

173. LYS, MAURICE, Fichier Alcide d'Orbigny, Espèces de Foraminifères décrites ou figurées dans ses ouvrages ou dans les Planches Inédites. Inst. Franç. Pétrole, Paris, 36 pp.
174. LYS, M., and SIGAL, J., French authors' card index: The Micropaleontologist, vol. 3, no. 4, pp. 23–24.
MAKINO, TOKIO, see KANEHARA, K. and others.
175. MALKIN, DORIS S., (Activities in micropaleontology) United States: Gulf Coast (with partial bibliography on the ecology of marine organisms): The Micropaleontologist, vol. 3, no. 4, pp. 2–5.
176. MARIE, P., Microfaunes pélagiques des couches à *Cardita beaumonti:* Soc. géol. France Comptes rendus, pp. 241–243.
MARIE, P., see ABRARD, R., and others.
MARIE, P., see LEFAVRAIS, A., and others.
177. MARLIÈRE, RENÉ, Maurice Leriche 1875–1948: Soc. géol. France Bull., vol. 5, vol. 19, pp. 313–342, 1 portrait.
178. MARQUIS, CH., and SZAKALL, V., Un niveau à microfaune dans le Lias de Caylus (Tarn-et-Garonne): ibid., pp. 97–98.
179. MARTINIS, B., Osservazioni sul lembo "Villafranchiano" di Valenza (Alessandria): Ist. Geol. Pal. Geogr. Fis. Milano, ser. G, no. 52, 4 pp. (non vidi).
180. MAYNC, WOLF, The foraminiferal genus *Choffatella* in the Lower Cretaceous (Urgonian) of the Caribbean region (Venezuela, Cuba, Mexico and Florida): Eclogae geol. Helvetiae, vol. 42, no. 2, pp. 529–547, 1 text-fig., 1 table, pls. 11, 12 (published summer, 1950).
MCCRACKEN, E., see GROHSKOPF, J. P. and MCCRACKEN, E.
MCGINTY, JAMES, see HENSON, F. R. S. and others
181. MCLEAN, JAMES, JR., A summary of the foraminiferal guide fossils of the Atlantic Coastal Plains region between New Jersey and Georgia: The author, Alexandria, Va., 3 sheets, typewritten and multigraphed.
MELLEN, FREDERIC F., see THOMPSON, M. L., and MELLEN, F. F.
182. MESSINA, ANGELINA R., Literature recently received: The Micropaleontologist, vol. 3, no. 3, pp. 23–40.
MESSINA, ANGELINA R., see ELLIS, F. B., and MESSINA, A. R.
MILLER, A. K., see THOMPSON, M. L., and MILLER, A. K.
MITSUNASHI, TAKASHI, see KANEHARA, K. and others
183. MOHLER, W. A., Das Alter des Eozänkalkes von Gunung Gamping, westlich Djokjakarta, Java (Abstract): Schweizer. naturf. Gesell., Verh., 129. Vers. Lausanne, pp. 150–151.
184. MOHLER, W. A., *Flosculinella reicheli*, n. sp. aus dem Tertiär e-5 von Borneo (Abstract): ibid., p. 151.
185. MOHLER, WILLI A., Das Alter des Eozän-Kalkes von Gunung Gamping westlich Djokjakarta, Java: Eclogae geol. Helvetiae, vol. 42, no. 2, pp. 519–521, 1 text-fig. (published summer, 1950).
186. MOHLER, WILLI A., *Flosculinella reicheli*, n.sp. aus dem Tertiär e_5 von Borneo: ibid., vol. 42, no. 2, pp. 521–527, 3 text-figs. (published summer, 1950).
187. MORNOD, LEON, Les Globorotalidés du Crétacé supérieur du Montsalvens (Préalpes fribourgeoises): ibid., vol. 42, no. 2, pp. 573–596, 14 text-figs., pl. 15 (published summer, 1950)
188. MORNOD, LEON, Les *Globotruncana* du Crétacé supérieur du Montsalvens (Fribourg): Schweizer. naturf. Gesell., Verhandl., 129, Vers Lausanne, pp. 139–140.
189. MOORE, RAYMOND C., Division of the Pennsylvanian system in Kansas: Univ. Kansas Publ., Kansas State Geol. Survey Bull. 83, 203 pp., 37 figs.
190. MOORE, RAYMOND C., and THOMPSON, M. L., Main divisions of Pennsylvanian period and system: Am. Assoc. Petroleum Geologists Bull., vol. 33, pp. 275–302, 2 text-figs.
191. MORET, LEON, and ROSSET, JEAN, Sur la présence de Lutétien lacustre et marin dans la chaine des Aravis (Hte. Savoie): Acad. Sci. Paris Comptes rendus, vol. 229, pp. 914–916.
192. MORISHIMA, MASAO, A new Miocene *Lepidocyclina* from Shizuoka prefecture, Japan: Jour. Paleontology, vol. 23, pp. 210–213, 1 text-fig., pls. 44, 45.
MOTOJIMA, KOJI, see KANEHARA, K. and others.
193. MURAOUR, PIERRE, Sur l'existence d'une cloison médiane chez certaines formes enroulées de Lagenidae: Acad. Sci. Paris Comptes rendus, vol. 228, pp. 419–420, 2 text-figs.
193a. MURAOUR, PIERRE, Contribution à l'étude micropaléontologique des marnes plaisanciennes d'Alger: Service, Carte géol. de l'Algérie, (1), Paléontologie no. 10, pt. 2; Trav. Lab. Géol. Fac. Sci. d'Alger, pp. 93–149, pls. 1–8, 3 text-figs. (no. 350 for the year 1949).
194. NALIVKIN, V. D., Middle Carboniferous south of the Ufa amphitheater: Akad. Nauk S.S.S.R., Izv., ser. geol. no. 2, pp. 105–110 (In Russian).
195. NAPOLI ALLIATA, ENRICO DI., (Activities in micropaleontology). Italy (with a bibliography on Italian micropaleontology 1948–1949): The Micropaleontologist, vol. 3, no. 4, pp. 8–12.
196. NATHAN, HANS, Geologische Ergebnisse der Erdölbohrungen im bayerischen Innviertel: Geol. Bavarica, no. 1, 68 pp., 5 text-figs., 6 tables, 1 pl.
197. NEVE, G. A. DE, Foraminifera from the shore zone of the islands of Roeang and Siaoe: Chronica Naturae (Batavia), vol. 105, pp. 113–115, 1 text-fig.
198. NEVE, G. A. DE, Opmerkingen over een foraminiferenhoudende kalksteen van Baranti op het schiereiland Sanggar (Soembawa) en de strandzanden van Poeloe Ngali

(Salehbaai) en Poeloe Madang: ibid., vol. 105, pp. 116–118.
199. NEVE, G. A. DE, Foraminifera from the shore zone of the islands Morotai and Ternate: ibid., vol. 105, pp. 196–198.
200. NEVE, G. A. DE, Foraminifera from the shore zone of Parigi and Poso (Gulf of Tomini): ibid., vol. 105, pp. 252–254.
201. NEVE, G. A. DE, Een notitie over de foraminiferen van de oudste diepzeelodingen in Indonesie: ibid., vol. 105, pp. 291–292.
202. NEVE, G. A. DE, Opmerking over fossile wervel, gevonden in Billiton: ibid., vol. 105, pp. 292–293.
203. NEWELL, NORMAN D., Phyletic size increase, an important trend illustrated by fossil invertebrates: Evolution, vol. 3, pp. 103–124, 6 text-figs. (Foraminifera, pp. 105–108).
204. NEWELL, NORMAN, D., Geology of the Lake Titicaca region, Peru and Bolivia: Geol. Soc. America Mem. 36, 111 pp., 17 pls., 14 text-figs.
205. NEWELL, NORMAN D., CHRONIC, B. JOHN, and ROBERTS, THOMAS G., Upper Paleozoic of Peru, Part I: The formations and geologic history: in: NEWELL, CHRONIC, and ROBERTS, Upper Paleozoic of Peru (copyright by authors), Univ. Service Bureau, Columbia Univ., New York, pp. 3–45, pls. 1–4, 5 text-figs.
206. NUTTALL, W. L. F., Discussion (of paper by T. BARNARD on lower Lias Foraminifera of the Dorset Coast): Geol. Soc. London Abstr. of Proc., no. 1448, p. 52.
207. OAKLEY, K. P., International Geological Congress, Eighteenth Session, Great Britain, 1948, Section H, The Plio-Pleistocene boundary: Geol. Mag., vol. 86, pp. 18–21.
OAYMA, KATSURA, see KANEHARA, K., and others.
208. OINOMIKADO, TSUNETERO, (Activities in micropaleontology) Japan: The Micropaleontologist, vol. 3, no. 1, pp. 18–19.
209. OINOMIKADO, TSUNETERO, Assemblage slide used in the laboratory of Imperial Oil Co., Tokyo, Japan: ibid., vol. 3, no. 2, p. 32, 1 text-fig.
210. OINOMOKADO, TSUNETERO, (Activities in micropaleontology) Japan: ibid., vol. 3, no. 3, pp. 10–11.
ONO, AKIRA, see KANEHARA, K. and others.
211. ORLINI, ANGELA, Sulla presenza di *Globotruncana calcarata* Cushman in Italia: Ist. Geol. Pal. Geogr. Fis. Univ. Milano, ser. P, no. 56, 6 pp., 4 figs. (non vidi)
212. OVEY, CAMERON D., Obituary: Dr. Joseph A. Cushman: Nature (London), vol. 163, no. 4155, p. 944.
213. OVEY, CAMERON D., (Activities in micropaleontology) Great Britain: The Micropaleontologist, vol. 3, no. 1, pp. 7–9.
214. OVEY, CAMERON D., The Zoological Record: ibid., vol. 3, no. 1, p. 21.
215. OVEY, CAMERON, D., (Activities in micropaleontology) Great Britain: ibid., vol. 3, no. 3, p. 6.
216. OVEY, CAMERON D., Note on the evidence for climatic changes from sub-oceanic cores: Weather, vol. 4, pp. 228–231, 1 text-fig., pl. 4.
OVEY, CAMERON D., see HOARE, C. D., and OVEY, C. D.
217. PARÉJAS, EDOUARD, and CAROZZI, ALBERT, Résultats de l'expédition géologique de l'Université de Harvard dans les Montagnes Rocheuses du Canada (Jasper National Park, 1929), Note no. 10: La sédimentation du Trias de Fiddle River: Archives sci. (Genève), vol. 2, pp. 567–571. 1 text-fig.
218. PÉRÉBASKINE, V., Contribution à la connaissance de l'age du flysch des Petites Pyrénées: Soc. géol. France Bull., vol. 5, vol. 19, pp. 269–270.
219. PETERSEN, GEORG, Condiciones geograficas y geologicas de la cuenca del Rio Zarumilla: Soc. geol. del Peru, Jubil., XXV Aniversario, pt. 2, fasc. 7, 39 pp., 2 pls., 2 figs., 1 map (Foraminifera determined on p. 27 by BETSABÉ ZANATTI).
220. PETKOVIC, K., Le Tithon-Valanginien dans la Serbe orientale: Belgrade Univ. Inst. Géol. Ann., vol. 17, pp. 15–45. (Serbian with summary in French; non vidi.)
221. PETTERSON, HANS, Submarine geology: Swedish deep-sea expedition 1947–1948 (Abstract) Geol. Soc. America Bull., vol. 60, no. 12, pt. 2, p. 1914.
222. PETTERSON, HANS, The geochronology of the deep ocean bed: Tellus (Sweden), vol. 1, no. 1, pp. 1–5, 1 fig.
223. PETTIJOHN, F. J., Sedimentary Rocks. New York, Harper's Geoscience Series, 526 pp., 131 text-figs., 40 pls.
224. PFENDER, JULIETTE, and SCHNEEGANS, D., A propos de l'age des calcaires des Morros de San-Juan (État de Guarico, Venezuela): Soc. géol. France Comptes rendus, pp. 91–93.
225. PHLEGER, FRED B., JR., Distribution of Foraminifera in northwestern Gulf of Mexico (abstract): Ann. Meeting AAPG, SEPM, and SEG, St. Louis, Program, p. 28.
226. PHLEGER, FRED B., JR., Foraminifera from the Canyon Tow in semi-consolidated sediments: Appendix A in: STETSON, H. C., The sediments and stratigraphy of the East Coast Continental Margin: Georges Bank to Norfolk Canyon: Mass. Inst. Technol. and Woods Hole Oceanogr. Inst. Papers in Phys. Oceanogr. and Meteorol., vol. 11, no. 2, pp. 53–57.
227. PHLEGER, FRED B., Pleistocene Research, 8, Submarine geology and Pleistocene research: Geol. Soc. America Bull., vol. 60, pp. 1457–1462.
228. PHLEGER, FRED B., JR., The Foraminifera. In: JOHNSON, F. (edit.), The Boylston Street Fishweir II. R. S. Peabody Found. Archaeology Papers, Phillips Acad., Andover, Mass., vol. 4, no. 1, pp. 99–108, pl. 14. (non vidi)
229. POKORNY, V., Tortonske fosilie od Trkmance u Velkych Pavlovic: Cas. Vlast.

Spol. Mus. Olomouci, vol. 58, pp. 1–7. (In Czech)

230. POKORNY, V., The microfauna of the Eocene green clay of Nikolcice: Inst. Acad. Sci. Prague Bull. (non vidi)

231. POPE, DAVID E., Occurrence of Harang fauna of the eastern Louisiana coastal parishes: Louisiana Dept. Cons. Geol. Bull. 26, July, 1948 (Distribution date: June, 1949), pp. 3–22, pls. 1–6. (see also: D. JETER SMITH).

POZARYSKI, W., see GUZIK, K., and POZARYSKI, W.

232. PURI, H. S., The limits of the upper Kirthar in the Indian region: Science and Culture (Calcutta), vol. 15, pp. 73–74, 1 chart.

233. PURI, H. S., (Activities in micropaleontology) India: The Micropaleontologist, vol. 3, no. 1, p. 17.

234. PURI, H. S., (Activities in micropaleontology) India: ibid., vol. 3, no. 2, pp. 19–22.

235. PURI, H. S., (Activities in micropaleontology) India: ibid., vol. 3, no. 3, pp. 8–10.

236. PURI, H. S., (Activities in micropaleontology) India: ibid., vol. 3, no. 4, p. 15.

237. PURI, H. S., and SEN, J., Recent advances in applied micropaleontology and micropaleobotany: Science and Culture (Calcutta), vol. 14, pp. 510–517.

238. RAU, PAUL JOSEPH, The use of the microphotographic objective to improve image definition in photomicrography of semimicro objects: Turtox News, vol. 27, no. 10, reprint, 4 pp., 2 figs.

239. RAU, WELDON W., Errata (Change of name of *Bolivina astoriensis* Rau, 1948 to *B. chehalisensis* Rau, 1949): Jour. Paleontology, vol. 23, p. 441.

240. RAUZER-CHERNOUSSOVA, D. M., Bashkirskyan or Kayalskyan stage ?: Akad. Nauk S.S.S.R. Izv., ser. geol., no. 2, pp. 61–76, 2 figs. (In Russian)

241. RECEVEUR, Mlle., SIGAL, J., and HUPÉ, P., Microfaunes du Crétacé supérieur (Campanien-Maestrichtien) des Hautes-Pyrénées: Soc. géol. France Comptes rendus, pp. 74–75.

242. REDMOND, C. D., (Activities in micropaleontology) Colombia: The Micropaleontologist, vol. 3, no. 1, p. 6.

243. REDMOND, C. D., (Activities in micropaleontology) Colombia: ibid., vol. 3, no. 3, pp. 3–4.

244. REDMOND, C. D., What is the genus *Eponides?*: ibid., vol. 3, pp. 19–21, 4 text-figs.

245. REEDY, FRANK, JR., Stratigraphy of the Frio formation, Orange and Jefferson counties, Texas: Am. Assoc. Petroleum Geologists Bull., vol. 33, pp. 1830–1858, 13 text-figs.

246. REICHEL, MANFRED, (Activities in micropaleontology) Switzerland: The Micropaleontologist, vol. 3, no. 1, pp. 10–13.

247. REICHEL, MANFRED, Observations sur les *Globotruncana* du gisement de la Breggia (Tessin) (abstract): Schweizer. naturf. Gesell., Verhandl., 129. Vers. Lausanne, pp. 136–137.

248. REICHEL, MANFRED, Sur un nouvel orbitoidé du Crétacé supérieur hellenique (abstract): ibid., p. 140.

249. REICHEL, MANFRED, Alvéolines de l'Oligocene-Miocene de Cuba (abstract): ibid., Verhandl., p. 148.

250. REICHEL, MANFRED, Remarques sur le genre *Boreloides* Cole et Bermudez (abstract): ibid., Verhandl., p. 148.

251. REICHEL, MANFRED, Sur un nouvel Orbitoidé du Crétacé supérieur hellenique: Eclogae geol. Helvetiae, vol. 42, no. 2, pp. 480–485, 10 text-figs. (published summer, 1950).

252. REICHEL, MANFRED, Observations sur les *Globotruncana* du gisement de la Breggia (Tessin): ibid., vol. 42, no. 2, pp. 596–617, 6 text-figs., pls. 16, 17 (published summer, 1950).

REICHEL, MANFRED, see RENZ, C., and REICHEL, M.

253. REITLINGER, E. A., Smaller Foraminifera in the lower part of the Middle Carboniferous of central Urals and Prikamj: Akad. Nauk S.S.S.R., Izv., geol. ser. no. 6, pp. 149–164, 1 pl. (in Russian, non vidi).

254. RENZ, CARL, Einige Fossilfunde im mitteleitalienischen Jura: Eclogae geol. Helvetiae, vol. 42, no. 2, pp. 548–557 (published summer, 1950).

255. RENZ, CARL, and REICHEL, MANFRED, Neue Fossilfunde in Griechenland und Vorderasien: ibid., vol. 42, no. 2, pp. 557–573, 1 text-fig., pls. 13, 14 (published summer, 1950).

256. RENZ, CARL, and REICHEL, MANFRED, Neue Foraminiferenfunde in Griechenland und Vorderasien (abstract): Schweizer. naturf. Gesell., Verhandl., 129. Vers. Lausanne, pp. 142–144.

257. RHUMBLER, LUDWIG, (edited by OTTO WETZEL), Plate explanations for "Die Foraminiferen (Thalamophoren) der Plankton-Expedition" (published by L. RHUMBLER; text and plates in 1911/13): The Micropaleontologist, vol. 3, no. 2, pp. 33–40.

RICOUR, J. see LEFAVRAIS, A., and others.

258. ROBERTS, THOMAS G., Upper Paleozoic of Peru, Part 3, Fusulinidae. In: NEWELL, CHRONIC, and ROBERTS, Upper Paleozoic of Peru (copyright by authors), Univ. Serv. Bureau, Columbia Univ., New York, pp. 174–241, pls. 36–43, text-figs. 12–43.

ROSSET, JEAN, see MORET, L., and ROSSET, J.

259. RUZICKA, B., and BENEŠ, K., Predbezna zprava o foraminiferach Frydeckych vrstev (Svrch. krida)—An interim report on the Foraminifera of the Frydek strata (Upper Cretaceous): Prirod. Sbor. Ostravskeho Kraje, vol. 10, no. 3, pp. 253–260, 2 pls.

260. SAID, RUSHDI, Foraminifera of the northern Red Sea: Cushman Lab. Foram. Research Spec. Pub. 26, 44 pp., 4 pls.

261. SAID, RUSHDI, Obituary: Dr. Max Blanck-

enhorn (1861–1947): Am. Jour. Sci., vol. 247, pp. 504–506.
262. SAKAKURA, KATSUHIKO, On the "degree of resemblance" in statistical studies: Geol. Soc. Japan (Tokyo), vol. 55, no. 644–645, pp. 49–50.
263. SALAS, GUILLERMO P., Geology and development of Poza Rica oil field, Veracruz, Mexico: Am. Assoc. Petroleum Geologists Bull., vol. 33, pp. 1385–1409, 15 figs., 2 tables.
264. SALAS, GUILLERMO P., Bosquejo geologico de la cuenca sedimentaria de Oaxaca: Asoc. Mexic. Geol. Petrol. Bol., vol. 1, pp. 79–152, 35 photos, 13 sections, 1 pl. (map).
265. SAURIN, E., Permien à fusulinidés de la Nam-Nga (Haut-Laos): Soc. géol. France Comptes rendus, pp. 47–49.
266. SAURIN, E., Sur l'age des calcaires du Pah Xieng Thong, province du Tran Ninh (Laos): ibid., pp. 326–328.
SCHNEEGANS, D., see PFENDER, J., and SCHNEEGANS, D.
267. SCHOELLER, H., L'age de la partie supérieure des sables à *Nummulites* du Blayais (Gironde): Soc. géol. France Comptes rendus, pp. 370–371.
268. SCHWARZBACH, M., Marine und nichtmarine Schichten in den paralischen Kohlenbecken: Zeitschr. Glückauf, Jahrg. 85, pp. 417–419, 2 text-figs.
269. SCHWARZMANN, M., Zum Gedenken an Kurt Frentzen: Beitr. Naturkund. Forschung in Südwest-Deutschland, vol. 8 (no pagination), 5 pp.
SEN, J. see PURI, H. S., and SEN, J.
270. SHEPARD, FRANCIS P., Submarine geology investigations at Scripps Institution of Oceanography (exhibit) (abstract): Geol. Soc. America Bull., vol. 60, no. 12, pt. 2, p. 1919
SHINADA, YOSHIJIRO, see KANEHARA, K. and others.
271. SIGAL, J., Dano-Montien ou Paléocène ? ou le passage du Crétacé au Tertiaire en Algérie: Soc. géol. France Comptes rendus, pp. 150–152.
272. SIGAL, J., Une date remarquable dans l'évolution de la microfaune du Cénomanien-Turonien en Algérie: ibid., pp. 264–266.
273. SIGAL, J., Sur quelques Foraminifères de l'Aquitanien des environs de Dax. Leur place dans l'arbre phylétique des Rotaliiformes: Inst. Franç. Pétrole et Ann. Comb. Liquides, Revue, vol. 4, pp. 155–165, 3 pls., 1 fig.
274. SIGAL, J., Fichier Henri Douvillé. Espèces de Foraminifères décrites ou figurées dans ses ouvrages: Inst. Franç. Pétrole, Paris, 9 pp.
275. SIGAL, J., Une exemple de polyphylétisme et d'évolution parallèle: le "genre" *Globotruncana* (Foraminifères): 13th Congr. Internat. Zoology, Paris, 1948, Extrait, Commun. sect. 9, pp. 548–549. Paris 1949.
SIGAL, J., see DAM, A. TEN, and SIGAL, J.
SIGAL, J., see DUBOURDIEU, J., and SIGAL, J.
SIGAL, J., see LYS, M., and SIGAL, J.
SIGAL, J., see RECEVEUR, Mlle, and others.
276. SIMON, LOUIS J., Foraminiferal picking tray: The Micropaleontologist, vol. 3, no. 3, pp. 21–22, 1 fig.
277. SIMPSON, GEORGE GAYLORD, The meaning of evolution. Yale Univ. Press, 364 pp., 38 figs. (Evolution in Foraminifera, origination rates on p. 104).
278. SMIT SIBINGA, G. L., Pleistocene eustasy and glacial chronology in Java and Sumatra: Nederland. Geol.-Mijnbouwk. Genootsch., Verhandl., geol. series, vol. 15, pp. 1–62, 3 figs., 1 table, 2 maps.
279. SMITH, D. JETER, Miocene Foraminifera of the "Harang sediments" of southern Louisiana: Louisiana Dept. Cons. Geol. Bull. 26 (July 1948, distributed June 1949) pp. 23–76, pls. 7–12, text-figs. 2, 3. (see also D. E. POPE).
280. SODER, PIERRE A., Geologische Untersuchung der Schrattenfluh und des südlich anschliessenden Teiles der Habkern-Mulde (Kt. Luzern): Eclogae geol. Helvetiae, vol. 42, no. 1, pp. 35–109, 12 figs., 1 table, pls. 5, 6.
SOYER, R., see ABRARD, R., and others.
281. STAINFORTH, R. M., The *Hannatoma* fauna in the Zapotal sands of southwest Ecuador: Jour. Paleontology, vol. 23, pp. 155–156.
282. STAINFORTH, R. M., Foraminifera in the Upper Tertiary of Egypt: ibid., vol. 23, pp. 419–422.
283. STAINFORTH, R. M., Nomenclatural notes on *Pullenia* and *Cibicides:* ibid., vol. 23, pp. 436–438.
284. STAINFORTH, R. M., Work in comfort: The Micropaleontologist, vol. 3, no. 2, pp. 29–30, 1 fig.
285. STAINFORTH, R. M., Further notes on fossil *Globigerina* oozes: ibid., vol. 3, no. 3, pp. 12–13.
286. STEFANI, TEODOSIO DE, Correzioni da apportare al foglio Palermo della Carta dell'Ufficio Geologico e relative considerazioni stratigrafico-tettoniche: Plinia, vol. 2, fasc. 1, pp. 1–5.
287. STETSON, HENRY C., The sediments and stratigraphy of the East Coast continental margin: Georges Bank to Norfolk Canyon: Mass. Inst. Technol., and Woods Hole Oceanogr. Inst., Papers in Phys. Oceanogr. and Meteorology, vol. 11, no. 2, 5 figs., 7 tables.
288. STEWART, ROSCOE E., and STEWART, KATHERINE C., Local relationships of the Mollusca of the Wildcat Coast section, Humboldt County, California, with related data on the Foraminifera and Ostracoda: Oregon Dept. Geol. Min. Industr. Bull. 36, pt. 8, pp. 165–208, figs. 5 and 7, table 1, pls. 19–22.
STEWART, ROSCOE E., and STEWART, KATHERINE C., see CUSHMAN, J. A. and others.
289. STONE, BENTON, New Foraminifera from northwestern Peru: Jour. Paleontology, vol. 23, pp. 81–83, pl. 21.

290. STONE, BENTON, Age of the Chira group, northwestern Peru: ibid., vol. 23, pp. 156–160, 1 table.
291. STONE, BENTON, (Activities in micropaleontology) Peru: The Micropaleontologist, vol. 3, no. 2, pp. 9–10.
STONE, BENTON, see CUSHMAN, J. A., and STONE, B.
292. STOYANOW, ALEXANDER, Lower Cretaceous stratigraphy in southeastern Arizona: Geol. Soc. America Mem. 38, 169 pp., 27 pls., 2 figs.
293. STUBBLEFIELD, C. J., International Geological Congress, Eighteenth Session, Great Britain, 1948, The International Paleontological Union: Geol. Mag., vol. 86, pp. 32–33.
294. SWINNERTON, H. H., Outlines of Paleontology. 3rd edition, London, Arnold and Co., 393 pp., illustr.
SZAKALL, V., see CUVILLIER, J. and others.
SZAKALL, V., see MARQUIS, CH., and SZAKALL, J.
TAPPAN, HELEN, see LOEBLICH, A. R., JR., and TAPPAN, H.
295. TASMAN, CEVAT E., Stratigraphy of southeastern Turkey: Am. Assoc. Petroleum Geologists Bull., vol. 33, pp. 22–31, 2 figs.
296. TASMAN, MEHLIKA IZGI, Adana strüktür sondajlari mikro-fauna'sinin etüdü. Foraminifera from test wells in Adana, Turkey,M aden tetk. ve Arama Enstit. Yayinlar. (Publ. Mining Research and Explor. Inst. Turkey), series B, no. 15, 42 pp., 6 pls., 1 map.
297. TALTASSE, P., Position stratigraphique des calcaires lacustres d'Ahermoumou (région de Fes, Maroc): Soc. géol. France Comptes rendus, pp. 163–164.
298. TEWARI, B. S., On a stellate Discocycline from the upper Eocene of Surat-Broach area (Bombay presidency): Current Science, vol. 18, p. 401, 1 text-fig.
299. THALMANN, HANS E., Bibliography and index to new genera, species, and varieties of Foraminifera for the year 1947: Jour. Paleontology, vol. 23, pp. 395–418.
300. THALMANN, HANS E., Bibliography and index to Foraminifera (Supplements and corrections for the period 1931 to 1947): ibid., vol. 23, pp. 498–506.
301. THALMANN, HANS E., Bibliography and index to new genera, species, and varieties of Foraminifera for the year 1948: ibid., vol. 23, pp. 641–668.
302. THALMANN, HANS E., Homonyms of Foraminifera erected in 1947: The Micropaleontologist, vol. 3, no. 2, p. 28.
303. THALMANN, HANS E., Charles Davies Sherborn 1861–1942: ibid., vol. 3, no. 3, pp. 19–21, 1 portrait.
304. THALMANN, HANS E., Tan Sin Hok 1902–1945: ibid., vol. 3, no. 4, pp. 25–26.
305. THALMANN, HANS E., Homonyms in Foraminifera erected during 1948 and 1949: Cushman Lab. Foram. Research Contr., vol. 25, pp. 100–103.
306. THALMANN, HANS E., Mitteilungen über Foraminiferen VIII (abstract): Schweizer. naturf. Gesell., Verhandl. 129. Vers. Lausanne, pp. 148–150.
307. THALMANN, HANS E., Regional-stratigraphische Verbreitung der Foraminiferengattung *Rzehakina* Cushman, 1927: ibid., p. 150.
308. THALMANN, HANS E., Regional-stratigraphische Verbreitung der Foraminiferengattung *Rzehakina* Cushman, 1927: Eclogae geol. Helvetiae, vol. 42, no. 2, pp. 506–507 (published summer, 1950).
309. THALMANN, HANS E., Mitteilungen über Foraminiferen VIII. 35. Die Gattung *Hantkenina* im indopazifischen Eozän: ibid., vol. 42, no. 2, p. 508.
310. THALMANN, HANS E., Mitteilungen über Foraminiferen VIII. 36. Bemerkungen zur Gattung *Lenticulina* Lamarck 1804: ibid., vol. 42, no. 2, pp. 508–509.
311. THALMANN, HANS E., Mitteilungen über Foraminiferen VIII. 37. Gehäuse-Grösse bei den Foraminiferen: ibid., vol. 42, no. 2, pp. 509–510.
312. THALMANN, HANS E., Mitteilungen über Foraminiferen VIII. 38. Uber aufgearbeitete Globotruncanen: ibid., vol. 42, no. 2, pp. 510–511.
313. THALMANN, HANS E., Mitteilungen über Foraminiferen VIII. 39. Stratigraphische Verbreitung der Foraminiferen-Familien: ibid., vol. 42, no. 2, pp. 511–514, table.
314. THALMANN, HANS E., Mitteilungen über Foraminiferen VIII. 40. Stratigraphische Verbreitung der Gattung *Hantkenina* in Cuba and Venezuela: ibid., vol. 42, no. 2, pp. 511, and 514.
315. THOM, EMMA MERTINS, HOOKER, MARJORIE, and DUNAVEN, RUTH REECE, Bibliography of North American geology 1946 and 1947: U. S. Geol. Survey Bull. 958, 658 pp.
316. THOMAS, H. DIGHTON, Discussion (of the paper by T. BARNARD on the lower Lias Foraminifera of the Dorset Coast): Geol. Soc. London Abstr. of Proc., no. 1448, p. 52.
317. THOMPSON, M. L., The Permian fusulinids of Timor: Jour. Paleontology, vol. 23, pp. 182–192, 1 text-fig., pls. 34–36.
318. THOMPSON, M. L., and MELLEN, FREDERIC F., Foraminifers in the Black Warrior Basin of Mississippi and Alabama: Mississippi. Geol. Soc. Guidebook 7th Field Trip, pp. 44–51, pl. 5.
319. THOMPSON, M. L., and MILLER, A. K., Permian fusulinids and cephalopods from the vicinity of the Maracaibo Basin in northern South America: Jour. Paleontology, vol. 23, pp. 1–24, pls. 1–8, 1 text-fig.
THOMPSON, M. L., see MOORE, R. C., and THOMPSON, M. L.
THOMPSON, T. F., see WOODRING, W. P., and THOMPSON, T. F.
320. TODD, RUTH, Memorial: Joseph A. Cushman 1881–1949: The Micropaleontologist, vol. 3, no. 3, pp. 15–18, 1 portrait.

321. TODD, RUTH, Recent literature on the Foraminifera: Cushman Lab. Foram. Research Contr., vol. 25, pp. 72: 103–105.
TODD, RUTH, see CUSHMAN, J. A., and TODD, R.
322. TOKUNAGA, SIGEMOTO, GOHARA, YASUMA, and KUWANO, YUKIO, Geology of Tama Hills in the western vicinity of Tokyo: Research Inst. Nat. Resources, Tokyo Misc. Rept., 14, pp. 43–60, 5 text-figs.
323. TOLUN, N., Notes géologiques sur la région de Silvan-Hazru: Geol. Soc. Turkey Bull., vol. 2, pp. 65–89, 3 pls.
324. TROMP, S. W., The value of Globigerinidae ratios in stratigraphy: Jour. Paleontology, vol. 23, pp. 223–224.
325. TROMP, S. W., The determination of the Cretaceous-Eocene boundary by means of quantitative, generic, microfaunal determinations and the conception of "Danian" in the Near East: ibid., vol. 23, pp. 673–676.
326. TROMP, S. W., Errata: ibid., vol. 23, p. 692.
327. TROMP, S. W., Additional information on the so-called "Middle Tertiary *Orbulina* surface": The Micropaleontologist, vol. 3, no. 3, p. 14.
328. TRUEMAN, A. E., Discussion (of the paper by T. BARNARD on lower Lias Foraminifera of the Dorset Coast): Geol. Soc. London Abstr. of Proc., no. 1448, pp. 51–52.
329. UMBGROVE, J. H. F., Structural history of the East Indies: Cambridge University Press, 63 pp., 67 text-figs., 4 tables, 9 pls., 1 map.
330. VAŠIČEK, M., Moravsti neogenni zastupci druhu *Vaginulina legumen* (Linné, 1758). Moravian Neogene representatives of the species *Vaginulina legumen* (Linnaeus), 1758: Sborn. Stat. geol. Ustav. Czechosl. Rep., vol. 16, pp. 329–399, 15 pls., 8 tables.
331. VAŠIČEK, M., Zprava o geologicku-mikropaleontologickych vyzkumech—Compte rendu des recherches géologiques et micropaléontologiques: Vestn. Stat. Geol. Ustav. Rep. Czechoslov., vol. 24, pp. 186–189.
332. VONDERSCHMITT, L., Alfred Senn (1899–1949): Schweizer. naturf. Gesell., Verhandl., 129. Vers. Lausanne, pp. 405–407.
333. VOORTHUYSEN, J. H. VAN, *Elphidiella arctica* als klimatologische indicator voor het Kwartair: Geol. en Mijnbouw, vol. 11, n.s., pp. 127–130, 1 table.
334. VOORTHUYSEN, J. H. VAN, Foraminifera of the Icenian (oldest marine Pleistocene) of the Netherlands: Nederl. Geol.-Mijnbouwk. Genootsch., Verhandl. geol. series, vol. 15, pp. 63–69, 1 pl., 2 text-figs.
335. VOORTHUYSEN, J. H. VAN, (Activities in micropaleontology) Holland: The Micropaleontologist, vol. 3, no. 1, pp. 13–14.
336. VOORTHUYSEN, J. H. VAN, (Activities in micropaleontology Holland: ibid., vol. 3, no. 2, pp. 10–11.
337. VOORTHUYSEN, J. H. VAN, *Lagena*-X: ibid., vol. 3, no. 2, p. 31, 4 text-figs.
338. VOORTHUYSEN, J. H. VAN, (Activities in micropaleontology) The Netherlands: ibid., vol. 3, p. 6.
339. WATERS, JAMES A., Joseph Augustin Cushman (1881–1949): Am. Assoc. Petroleum Geologists Bull., vol. 33, pp. 1457–1465, 1 portrait.
340. WEAVER, CHARLES E., Geology of the Coast Ranges immediately north of the San Francisco Bay region, California: Geol. Soc. America Mem. 35. 242 pp., 14 pls., 2 figs.
341. WEGMÜLLER, WALTER, Zur Frage der stratigraphischen und tektonischen Stellung des Platten-Flysches in der Simmentaler-Mulde: Bern, Wehrlin & Co., 8 pp., 1 text-fig.
342. WEISS, HANS, Stratigraphie und Mikrofauna des Klippenmalm: Thesis, Univ. Zürich (Buchdruckerei Dr. J. Weiss, Affoltern a. Albis), 306 pp., 16 pls., 3 tables, 17 text-figs.
WETZEL, OTTO, see RHUMBLER, L.
343. WHITE, M. P., A fusulinid slide rule (abstract): Ann. Meeting, AAPG, SEPM, and SEG, St. Louis, Program, p. 30.
344. WICHER, CARL A., On the age of the higher Upper Cretaceous of the Tampico embayment area in Mexico, as an example of the worldwide existence of micro-fossils and the practical consequences arising from this: Mus. Hist. Nat. du Pays Serbe Bull. (A-2), Beograd, pp. 50–75 (Serbian text); pp. 76–105 (Egnlish text), pls. 2–8.
345. WICKENDEN, R. T. D., Some Cretaceous sections along Athabaska River from the mouth of Calling River to below Grand Rapids, Alberta: Canada Dept. Min. Res. Geol. Surv. Paper, no. 49-15; 31 pp., 1 map (non vidi).
346. WISEMAN, J. D. H., Geology of the deep-sea floor: Nature (London), vol. 164, no. 4173, pp. 682–684.
WOLCOTT, P. P., see DUSENBURY, A. N., JR., and WOLCOTT, P. P.
347. WOOD, ALAN, Discussion (of the paper by T. BARNARD on the lower Lias Foraminifera of the Dorset Coast): Geol. Soc London Abstr. of Proc., no. 1448, p. 51.
348. WOODRING, W. P., and THOMPSON, T. F., Tertiary formations of Panama Canal Zone and adjoining parts of Panama: Am. Assoc. Petroleum Geologists Bull., vol. 33, pp. 223–247, 2 text-figs.
YASUKINI, NOBORU, see KANEHARA, K. and others.
ZANATTI, BETSABÉ, see PETERSON, G.
349. ZELLER, EDWARD J., Endothyroid Foraminifera from Madison and Brazer formations of Utah (abstract): Ann. Meeting, AAPG, SEPM, and SEG, St. Louis, Program, p. 36.

SUPPLEMENT FOR 1933

350. VARENTSOV, M. I., and MENNER, V. V., On the age of some horizons of the Paleogene of the Gorysk area of Georgia: Neft.

geol-rzved. Inst., Inform. Sbornik, no. 2-3, pp. 102–105. (No. 397 for the year 1933).

SUPPLEMENT FOR 1936

351. PILLOUD, J., Contribution à l'étude stratigraphique des Voirons (Préalpes externes, Haute-Savoie): Archives sci. phys. nat. Genève, ser. 5, vol. 18. (No. 389 for the year 1936).

SUPPLEMENTS FOR 1937

352. PUTRJIA, F. S., On the stratigraphy of the Middle Carboniferous of the southeastern part of the Bolshoi-Donbas (In Russian): Azov-Black Sea Geol. Trust, Geol. and Min., Resources, Contr. (Materialy), Sborn. no. 1, pp. 41–76, 2 pls. (No. 436 for the year 1937).
353. PUTRJIA, F. S., On the group of *Fusulina distenta* Roth and Skinner from the Middle Carboniferous of the Donetz Basin and other localities (In Russian): ibid., Contrib. (Materialy, no. 1, pp. 77–82, 1 pl. (No. 437 for the year 1937).

SUPPLEMENTS FOR 1938

354. PUTRJIA, F. S., Results of micropaleontological study of cores from wells sunk in the vicinity of the station Razdorskaya on the Don (In Russian): ibid., Contrib. Materialy), vol. 2, pp. 17–28, 1 pl. (No. 361 for the year 1938).
355. WADELL, H. A., Physical-geological features of Peten, Guatemala: Carnegie Inst. Washington Publ. 437, Appendix 1, pp. 336–348, 7 figs. (No. 362 for the year 1938).

SUPPLEMENTS FOR 1939

356. AUGUSTA, J., K.70 narozeninam Dr. J. Pernera: Vedy Prirodni, vol. 19, pp. 227–229 (No. 349 for the year 1939).
357. LIVENTAL, V. E., Tertiary microfauna of the Nebit-Dag in Turkmenia, U.S.S.R. (In Russian): Problems Oil Geol. Trans., pp. 48–55. (No. 350 for the year 1949).
358. MERCIER, JEAN, Une microfaune dans les argiles bathoniennes de Port-en-Bessin (Calvados). Note préliminaire: Soc. Linn. Normandie, Procès-Verbaux 1939, p. 49. (No. 351 for the year 1939).
359. PUTRJIA, F. S., On the study of the Middle Carboniferous Foraminifera in the Donetz Basin (In Russian): Azov-Black Sea Geol. Trust, Geol. and Min. Resources, Contr. (Materialy), vol. 8, pp. 175–188, 1 pl. (non vidi). (No. 352 for the year 1939).
360. SEMIKHATOVA, E. N., Fusulinids from the region of the Don-Medveditsa uplifts. (Russian with summary in English): Sci. Mem. Molotov Univ., Rostov-on-Don, Chair Hist. Geol. and Paleont., pp. 90–131, 3 pls., 1 text-fig. (non vidi). (No. 353 for the year 1939).

SUPPLEMENTS FOR 1940

361. DESIO, ARDITO, Ernesto Mariani: Soc. italiana sci. nat. Atti, vol. 79, pp. 11–19. (No. 294 for the year 1940).
362. DESIO, ARDITO, Ernesto Mariani. Parole commemorativo: R. Ist. Lombardo Sci. Nat. e Lett., Rendic., Parte gen. e Atti uffic., vol. 73, pp. 1–11, 1 portrait. (No. 295 for the year 1940).

SUPPLEMENTS FOR 1941

363. BIERTHER, WILHELM, Vorläufige Mitteilung über die Geologie des östlichen Scoresbylandes in Nordostgrönland: Meddelelser om Grønland, vol. 114, no. 6, 20 pp., 2 pls., 2 figs. (No. 293 for the year 1941).
364. ISHIZAKI, KAZUHIKO, A brief note on the Foraminifera of the Byoritu beds of Kotobukiyama, Takao, Taiwan (in Japanese): Taiwan Tigaku Kizi, vol. 12, pp. 7–8. (No. 294 for the year 1941).
365. KOBAYASHI, T., The Sakawa orogenic cycle and its bearing on the origin of the Japanese islands: Tokyo Imp. Univ. Fac. Sci. Jour. (2), vol. 5, pt. 7, 578 pp., 4 pls., maps. (No. 295 for the year 1941).
366. NIELSEN, EIGIL, Remarks on the map and the geology of Kronprins Christians Land: Meddelelser om Grønland, vol. 126, no. 2, 35 pp., 1 pl., 9 figs. (No. 296 for the year 1941).
367. RAUSER-CHERNOUSSOVA, D. M., New data on the stratigraphy of the Upper Carboniferous of the Oksk-Zninsk bank: Acad. Sci. URSS Comptes rendus (Doklady), vol. 30, pp. 436–438. (No. 297 for the year 1941).
368. SOCIN, A., Affioramenti di Terziario nel foglio Cherso (Istria): Soc. toscana sci. nat. proc. verb., vol. 50, pp. 19–25. (No. 298 for the year 1941).
369. YAKOVLEV, N., Sur le complexe salifère du bassin du Donetz: Acad. Sci. URSS. Comptes rendus (Doklady), vol. 30, pp. 431–432. (No. 299 for the year 1941).

SUPPLEMENTS FOR 1942

370. BAKALOW, P., Tortonische Foraminiferenfauna von Nord-Bulgarien: Univ. Sofia, Fac. phys.-math., Ann., vol. 38, no. 3, 22 pp., figs. (non vidi). (No. 273 for the year 1942).
371. GORTANI, M., Gli "strati di Graua," orizonte mesocretacico dell'Africa orientale italiane: R. Accad. Sci. Nat., Italia, Atti, vol. 3, pp. 782–785. (No. 274 for the year 1942).
372. HANZAWA, SH., Studies of Tertiary higher Foraminifera: Tokyo, 1942. (In Japanese; non vidi). (No. 275 for the year 1942).
373. KOBAYASHI, T., On the climatic bearing of the Mesozoic floras in eastern Asia: Japanese Jour. Geology and Geography, vol. 18, pp. 157–196, 14 tables, 2 maps. (No. 276 for the year 1942).
374. ROYO Y GOMEZ, J., Contribucion a la pa-

leontologia de la region Paipa-Duitama-Santa Rosa (Boyaca): Serv. Geol. Nacion., Bogotá, Colombia, vol. 5, pp. 44–51. (No. 277 for the year 1942).

375. SIGNORINI, R., La serie stratigrafica cenozoica tra Pianora, Loiano e Valdo nel Bolognese: R. Accad. Italia, Rendic., ser. 7, vol. 3, pp. 132–140. (No. 278 for the year 1942).
376. WINKLER, E., Tortonfauna aus einem neuen Aufschluss bei Wien-Perchtoldsdorf: Reichsamt f. Bodenforschg. (Oesterreich), Ber., no. 7–8, pp. 103–108, 1 fig. (No. 279 for the year 1942).

SUPPLEMENTS FOR 1943

377. BERTALAN, K., Bakonybel környekenek eocen kepzödmenyei (The Eocene of the environs of Bakonybel, Penzeskut and Korisgyör, Bakony-Forest, Hungary): Földt. Közlony, vol. 73, 1943, Budapest 1947. (non vidi). (No. 240 for the year 1943).
378. DESIO, ARDITO, Ernesto Mariani, 17 agosto 1863—29 ottobre 1939: Comit. Glaciol. Ital. Boll , no. 22, pp. iii–v, 1 portrait. (No. 241 for the year 1943).
379. ISHIZAKI, K., On the species of *Ellipsonodosaria* from Japan: Nat. Hist. Soc. Formosa Trans., vol. 33, pp. 678–689, 15 text-figs. (No. 242 for the year 1943).
380. IZHIZAKI, K., New species of Neogene, Pleistocene and Recent Foraminifera of Japanese Empire (I): ibid., vol. 33, pp. 19–23, figs. (No. 243 for the year 1943).
381. ISHIZAKI, K., On the aperture of the foraminiferal genus *Streblus:* ibid., vol. 33, pp. 90–95, figs. (in Japanese). (No. 244, for the year 1943).
382. ISHIZAKI, K., On some Japanese species of *Lagenonodosaria:* ibid., vol. 33, pp. 215–220, pl. 10. (No. 245 for the year 1943).
383. ISHIZAKI, K., On the species of *Streblus* in Taiwan (in Japanese): Taiwan Tigaku Kizi, vol. 14, pp. 47–60, pls. 1, 2. (No. 246 for the year 1943).
384. IVANOV, L. A., Geology of the region of Besovo-Dragojna in the Rhodopus and plateau of Thrace as far as Marica in the north (in Bulgarian): Soc. géol. Bulgare Revue, vol. 14, pp. 207–253, 5 pls. (No. 247 for the year 1943).
385. RAUSER-CHERNOUSSOVA, D. M., On the stratigraphy and paleogeography of the Visean and Namurian stages (Carboniferous) of the Russian platform and southern near-Urals area: (Russian with summary in English): Acad. Sci. URSS, (B), ser. geol., no. 2, pp. 27–35. (No. 248 for the year 1943).
386. TAVANI, G., Appunti sulla geologia della regione di Castel d'Aiano (Appennino settentrionale): Soc. toscana sci. nat. Mem., vol. 51, pp. 1–10. (No. 249 for the year 1943).

SUPPLEMENTS FOR 1944

387. GÖTZINGER, G., Analogien im Eozänflysch der mährischen Karpaten und der Ostalpen: Reichsamt f. Bodenforschg., Wien, Ber. 1944 (Wien, 1945), pp. 139–160, 7 figs. (No. 203 for the year 1944).
388. ISHIZAKI, K., New species of Neogene, Pleistocene and Recent Foraminifera of the Japanese Empire (2): Nat. Hist. Soc. Formosa Trans., vol. 34, pp. 98–105, pl. 3, (No. 204 for the year 1944).
389. TANNER, HANS, Beitrag zur Geologie der Molasse zwischen Ricken und Hörnli: Thurgau. Naturf. Gesell., Mitt., vol. 33, 108 pp., illustr. (No. 205 for the year 1944).

SUPPLEMENTS FOR 1945

390. AZZAROLI, A., Sulle faune a macroforaminiferi dei dintorni di Firenze: Soc. geol. italiana Boll., vol. 64 (1945), Roma, 1947, pp. 32–34. (No. 246 for the year 1945).
391. DARDER PERICAS, B., Estudio geologico del sur de la provincia de Valencia y norte de Alicante: Inst. geol. España Bol., vol. 57, no. 1, 775 pp., illustr. (No. 247 for the year 1945).
392. LIPPARINI, TINO, Microfauna turoniana a *Globotruncana* delle argille scagliose di Savigno (Bologna): Soc. geol. italiana Bol., vol. 64 (1945), Roma 1947, p. 20. (non vidi). (No. 248 for the year 1945).
393. OSSIPOVA, A. J., Le flysch du Paléozoique supérieur de la rivière Juriazan: Soc. Natural. Moscou Bull., vol. 50, sect. geol., vol. 20, pp. 111–119, 1 pl., 2 text-figs. (No. 249 for the year 1945).
394. PETTERSON, HANS, Iron and manganese on the ocean floor: a contribution to submarine geology: Göteborg K. Vetensch. och Vitterh.-Samh., Handl., (6), B, vol. 3, no. 8, 37 pp. (No. 250 for the year 1945).
395. PRINCIPI, P., Contributo alla monografia sul Lago Trasimeno: Riv. Biologia (Firenze), vol. 37, pp. 90–104. (No. 251 for the year 1945).

SUPPLEMENTS FOR 1946

BALDWIN, E. M., see WILKINSON, W. D., and others.

396. BÜRGL, H., Zur Stratigraphie und Tektonik des oberösterreichischen Schliers: Geol. Bundesanstalt Oesterreich Verhandl., 1946, no. 10-12, pp. 123–151, 3 figs., 1 pl. (Issued 1949). (No. 271 for the year 1946).

FREMY, P., see LEMARDELEY, F., and FREMY, P.

397. GRILL, R., Foraminiferenkatalog von Brooks F. Ellis und Angelina R. Messina: Geol. Bundesanstalt Oesterreich Verhandl., Heft 10–12, Wien 1946, pp. 163–167, 1 text-fig. (No. 272 for the year 1946).
398. HENBEST, LLOYD G., in MCCANN, F. TH., RAMAN, N. D., and HENBEST, L. G.: Section of Morgan formation, Pennsylvanian, at Split Mountain in Dinosaur National Monument, Utah: U. S. Geol. Surv. Miscell. Publ. on Min. Research, 18 pp., 1 pl. (No. 273 for the year 1946).

399. ISII, M., and MAKINO, H., On the discovery of *Discocyclina* in the Setogawa series (in Japanese): Geol. Soc. Japan Jour., vol. 52, no. 610–12, pp. 1–2, 1 text-fig. (No. 274 for the year 1946).
400. LAIRD, W. M., The subsurface stratigraphy of the Nesson anticline: North Dakota Geol. Surv. Bull. 21, pp. 11–25. (No. 275 for the year 1946).
401. LEMARDELEY, F., and FREMY, P., Préparations microscopiques de test de foraminifères: Soc. Linn. Normandie, series B (9), vol. 4, pp. 15–19. (No. 276 for the year 1946).
LOWRY, W. D., see WILKINSON, W. D. and others.
402. MAJZON, L., and REICH, L., Genetic relations between the tuff beds of the Transylvanian basin and the volcanic chain of Mount Csicso (In Hungarian with summary in English): Földtany. Közlöny, vol. 75–76, 1945–46, pp. 44–52, 2 figs. (No. 277 for the year 1946).
MAKINO, H., see ISII, M., and MAKINO, H.
403. MARIE, P., Sur la faune des foraminifères des îles atlantides et sur quelques récoltes du S.S. "Talisman" (Campagne de 1883): Contrib., Etude Peuplements des Iles Atlantides, pp. 295–324, 1 map. (No. 278 for the year 1946).
404. MARGERIE, E. DE, Lucien Cayeux: Geol. Soc. London Quart. Jour., no. 406, vol. 102, pt. 2, pp. xxxvii–xxxix. (No. 279 for the year 1946).
405. MULLERRIED, F. K. G., Breve sintesis del estudio paleobiologico de la caliza y fosiles del Senoniano medio en la region de Penuela y del Albiano medio de la region de Orizaba, Veracruz: Comm. Imp. Coord. Invest. Cient. Mexico, Anuario 1945, Mexico 1946, pp. 259–260. (No. 280 for the year 1946).
406. NIKITINA, J. P., Comprehensive report on the Lower Cretaceous deposits of the Emba oil region (in Russian): Sci. Research Work ZNIL in the Petroleum Industry, 1946. (non vidi). (No. 281 for the year 1946).
407. PETTERSON, HANS, En Svensk djuphavsexpedition (abstract): Geol. Fören. Förhandl., vol. 68, no. 446, pp. 499–500. (No. 282 for the year 1946).
408. RAUSER-CHERNOUSSOVA, D. M., Visean and Tournaisian foraminifers from a drill hole at Nordwick (Yurung-Tumus peninsula). (Russian with summary in English): Subsurface of the Arctic, no. 1, pp. 203–209. (No. 283 for the year 1946).
REICH, L., see MAJZON, L., and REICH, L.
409. SELLI, RAIMONDO, La stratigrafia si un pozo profondo perforato presso Pontelagoscura (Ferrara): Giorn. Geologia, Bologna (2), vol. 18, pp. 53–72. (No. 284 for the year 1946).
410. STEWART, RALPH, Geology of Reef Ridge, Coalinga District, California: U. S. Geol. Surv. Prof. Paper 205-C, pp. 81–115, pls. 9–17, text-figs. 10–13, 2 tables. (No. 285 for the year 1946).
411. TEVES, J. S., Microfossils in the Philippines. Philippine Geologist, vol. 1, pp. 25–28. (No. 286 for the year 1946).
412. WILKINSON, W. D., LOWRY, W. D., and BALDWIN, E. M., Geology of the St. Helens quadrangle, Oregon: Oregon Dept. Geol. and Min. Industr. Bull. 31, 39 pp., 2 pls., 5 text-figs. (No. 287 for the year 1946).

SUPPLEMENTS FOR 1947

413. Anonymous, Jean Cuvillier: Paris Université Ann., vol. 17, no. 4, pp. 338–339, 1 portrait. (No. 255 for the year 1947).
414. BIEDA, FR., On the geological structure of the region of Gromnik (abstract). (In Polish): In: Stach, List of works achieved in the fields of mathematics and sciences in Poland etc., Krakowie, Akad. Umiej, pp. 182–183. (No. 256 for the year 1947).
415. BIEDA, FR., The stratigraphy of the Flysch of the Polish Carpathians based on great Foraminifera. (Abstract, in Polish): in: ibid., pp. 183–185. (No. 257 for the year 1947).
416. BIEDA, FR., On some microfaunas of Foraminifera from the Carpathian sandstones and conglomerates (abstract in Polish): ibid., pp. 185–186. (No. 258 for the year 1947).
417. CHECCHIA-RISPOLI, G., Sull-essistenza del Maestrichtiano nella Miugurtina: Accad. Nazion. Lincei, Clase sci. fis-mat. nat. Rendic., Roma (8), vol. 2, pp. 743–745. (No. 259 for the year 1947).
418. CITA, M. B., Sulla natura litologica di alcune rocce di età eocenica della regione di Gargagno (Lago di Garda): Soc. geol. italiana Boll., vol. 66, pp. 13–15. (No. 260 for the year 1947).
419. COLOM, G., and MORENO, I., Foraminiferos de las margas plasencienses de los Nuevos Tejares de Malaga (Abstract): Soc. española historia nat. Bol., vol. 45, p. 392. (No. 261 for the year 1947).
420. DUNBAR, C. O., and MISCH, P., Fusulinebearing Permian rocks of northwestern Yunnan: Geol. Soc. China Bull., vol. 27, pp. 101–110, 1 pl., 4 text-figs. (No. 262 for the year 1947).
421. GRANELLO, B., Descrizione geologica dei dintorni di S. Massenzo (Trentino): Soc. geol. italiana Boll., vol. 65, pp. 67–78, 2 figs. (No. 263 for the year 1947).
422. HARNISCH, O., Wechsel des Lebensraumes bei Tieren: Natur u. Volk, vol. 77, pp. 102–105, illustr. (No. 264 for the year 1947).
423. KAO, C. S., Permian stratigraphy and paleogeography of Fukien: Geol. Soc. China Bull., vol. 27, pp. 111–122, 4 text-figs., map. (No. 265 for the year 1847).
424. KÜHN, OTTO, Zur Stratigraphie und Tektonik der Gosauschichten: Akad. Wiss. Wien, Sitzungsber., Abt. I, vol. 156, pp. 181–200. (No. 266 for the year 1947).

425. KÜHN, OTTO, Gliederung und Fossilführung des Lias und Doggers in Franken: Naturforsch. Gesell. Bamberg, Ber., vol. 30, pp. 33–89. (No. 267 for the year 1947).
426. LASKY, S. G., Geology and ore deposits of the Little Hatchet Mountains, Hidalgo and Grant counties, New Mexico: U. S. Geol. Survey Prof. Paper 208, 101 pp., 27 pls., 18 figs. (No. 268 for the year 1947).
427. LEIGHTON, HENRY, Guidebook to the geology about Pittsburgh, Pa.: Pennsylvania Geol. Survey, (4), Bull. G-17 (reprint of 1939 edition), 35 pp., 21 figs. (No. 269 for the year 1947).
428. LIPINA, O. A., Foraminifera of the Chernyshink series of the Tournaisian stage of the Submoscovian, Lower Carboniferous. (In Russian): Akad. Nauk. S.S.S.R., Inst. geol. Nauk, Trudy, fasc. 62. (non vidi). (No. 270 for the year 1947).
429. MIGLIORINI, C. I., Età del macigno dell'Appennino lucchese: Soc. geol. italiana Boll., vol. 64, 1945, Roma 1947, pp. 17–18. (No. 271 for the year 1947).
MISCH, P. see DUNBAR, C. O., and MISCH, P.
MORENO, I., see COLOM, G., and MORENO, I.
430. NORDMANN, V., Victor Madsen 1865–1947; Meddels. Dansk, Geol. Forening, vol. 11, pp. 165–170, 1 portrait. (No. 272 for the year 1947).
431. POKORNY, V., Globigerinove souvrstvi ve zdanickem flys: (In Czech): Cas. Vlast. Spol. Mus. ve Olomouci, vol. 56, no. 1, pp. 1–6. (No. 273 for the year 1947).
432. POKORNY, V., Ke geologii okoli Hustopeci. (Contribution à l'étude de la géologie des environs de Hustopece (Czech with summary in French): Zvlast. Otorn. Sborn. Stat. Geol. Ustav. Ceskosl. Rep., vol. 14, pp. 325–360, 2 pls. (No. 274 for the year 1947).
433. PREMIK, J., Fauna of the Paleogene and the Neogene Flysch of Central Albania (Tirana-Berat): in STACH, J. (edit.), List of works achieved . . . mathematics and sciences in Poland, etc., Akad. Umiej. Krakowie, pp. 196–198 (abstract). (No. 275 for the year 1947).
434. RAUSER-CHERNOUSSOVA, D. M., On the paleogeography of the central part of the Russian platform during Carboniferous time. (In Russian): Akad. Nauk, S.S.S.R., Trudy, ser. geol., no. 6, pp. 87–96, 1 map. (No. 276 for the year 1947).
435. SACCO, F., L'età del "macigno": Accad. Naz. Lincei, Clase fis. mat. nat., Rendic., (8), vol. 2, pp. 739–743. (No. 277 for the year 1947).
436. SAMOILOVA, R. B., On some characteristic species of Foraminifera from the upper Paleogene in the Crimea (Russian with summary in English): Soc. Natural. Moscou Bull., n.s., vol. 52, sect. géol., vol. 22, no. 4, pp. 77–101, 42 text-figs. (No. 278 for the year 1947).
437. SUN, Y. C., and SZETU, S. S., Preliminary notes on the stratigraphy and structure of the Paoshan region, W. Yunnan: Nat. Univ. Peking Geol. Inst. Contr., no. 32, 25 pp., 7 text-figs., 1 table, 1 map. (No. 279 for the year 1947).
SZETU, S. S., see SUN, Y. C., and SZETU, S. S.
438. TEICHERT, C., Stratigraphy of western Australia: Royal Soc. New South Wales Jour., vol. 80, pp. 81–142, tables. (No. 280 for the year 1947).
439. WOODS, H., Palaeontology: Invertebrate: Cambridge Univ. Press, Reprinted 8th edition, 477 pp., illustr. (Foraminifera on pp. 17–32 incl. Radiolaria): (No. 281 for the year 1947).

SUPPLEMENTS FOR 1948

440. ACCORDI, B., Contributo alla conoscenza delle faune subfossili del sottosuelo della pianura ferrarese: Riv. italiana paleontologia, vol. 54, no. 1, pp. 36–39. (No. 322 for the year 1948).
441. ANDEL, T. J. VAN, Some remarks on *Nummulites javanus* Verb. and *Nummulites perforatus* de Montf.: K. Nederl. Akad. Wetensch. Amsterdam, Proc., vol. 51, no. 8, pp. 1013–1023, 3 text-figs., 3 tables. (No. 323 for the year 1948).
442. ANDERSON, F. W., The fauna of the "100 feet beach" clays: Edinburgh Geol. Soc. Trans., vol. 14, pt. 2, pp. 220–229, 2 figs. (No. 324 for the year 1948).
443. ANONYMOUS, Elenco delle publicazioni del prof. Federico Sacco: Torino, Tipogr. Chechini, 29 pp. (No. 325 for the year 1948).
444. AZZAROLI, A., Alcune Alveoline dell'Eocene inferiore della Migiurtina: Soc. toscana sci. nat. Atti, Mem., vol. 55, (A), no. 7, 7 pp., 2 pls. (No. 326 for the year 1948).
445. BLUMENTHAL, M., Un aperçu de la géologie des chaines nordanatoliennes entre l'Ova de Bolu et le Kizilirmak inférieur (Turkish and French text): Maden tetk. ve Arama Enstit. Yayinl., (B), no. 13, 127 pp., 54 photographs. (No. 327 of the year 1948).
446. CAMBIER, R., Federico Sacco (5 fevrier 1864–2 octobre 1948): Soc. Belge Géol. Pal. Hydrol. Bull., vol. 57, pp. 752–754. (No. 328 for the year 1948).
447. CAROZZI, ALBERT, Étude stratigraphique et micrographique du Purbeckien du Jura Suisse: Thesis Univ. Genève, No. 1122 (Arch. Sci. Genève, vol. 1), fasc. 1, 175 pp., 54 text figs., 6 pls. (No. 329 for the year 1948).
448. CIPOLLA, F., Commemorazione del prof. G. PPe. Checchia-Rispoli letta nell'Istituto di Geologia dell'Universita di Palermo: Gior. sci. nat. econ., Sez. I, Pubbl., vol. 45, no. 9, 3 pp. (No. 330 for the year 1948).
449. CIZANCOURT, MARIA DE, Matériaux pour la paléontologie et la stratigraphie des régions caraibes: I. Les genres *Miscellanea* Pfender et *Pellatispirella* Hanzawa: Soc. géol. France Bull., ser. 5, vol. 19, 1948

(published September, 1949), pp. 663–669, pl. 23. (No. 331 for the year 1948).

450. CIZANCOURT, MARIA DE, Matériaux pour la paléontologie et stratigraphie des régions caraïbes: II. Quelques grands foraminifères du Maestrichtien et de l'Eocène du Venezuela: ibid., Bull. ser. 5, vol. 19, pp. 670–673, pl. 24, (published September, 1949). (No. 332 for the year 1948).

450a. CRESPIN, IRENE, Indo-Pacific influences in Australian Tertiary foraminiferal assemblages: Royal Soc. South Australia Trans., vol. 72, (1), pp. 133–142, 1 text-fig. (map), 1 correlation table. (No. 376 for the year 1948).

451. DALEON, BENJAMIN A., A summary of the stratigraphy and foraminiferal assemblages at Phodeco's Cebu No. 2 well: Philippine Geologist, vol. 2, no. 4, pp. 19–23. (No. 333 for the year 1948).

452. DANGEARD, L., Organisms des oolithes carbonifères: Musée Roy. Hist. Nat. Belgique Bull., vol. 24, no. 31, 4 pp., 1 pl. (No. 334 for the year 1948).

453. DAVIES, L. N., Note on fossil Foraminifera, in: HIRST, T., Gold Coast Colony Rept. Geol. Surv. Dept. for . . . 1940–41 to 1945–46; 25 pp., 2 pls.; 1947; 1946–47, 10 pp., 1948. (No. 335 for the year 1948).

454. EPPRECHT, W., Das Nummulitenerz von Lowers (Kt. Schwyz): Schweizer. Min. Pet. Mitt., vol. 28, pp. 84–89, 2 figs. (No. 336 for the year 1948).

455. ERASMO, G. D', Guiseppe Checchia Rispoli: Accad. Sci. fis. mat. nat. Italia, Rendic., vol. 14, pp. 268–278. (No. 337 for the year 1948).

FINLAY, H. J., see MACPHERSON, E. O.

FINLAY, H. J., see WELLMAN, H. W.

456. FRIEDBERG, W., A contribution to the knowledge of the Miocene of Poland, Part IV: (Polish with summary in English): Polsk. Tow. Geol. Roc., vol. 17, pp. 223–235. (No. 338 for the year 1948).

457. HAGG, R., Interglaciala fossil från Ven: Geol. fören. Förh., vol. 70, p. 244. (No. 339 for the year 1948).

458. HANSEN, S., Victor Madsen 2. Maarts 1865–16. July 1947: Naturhist. Tidende, vol. 12, no. 1, pp. 11–3, 1 portrait. (No. 340 for the year 1948).

459. ISHIZAKI, K., Six new fossil species of *Streblus* from eastern Asia (Prefatory note by prof. I. Hayasaka): Acta Geol. Taiwanica, vol. 2, no. 1, pp. 55–66, 1 pl. (No. 341 for the year 1948).

460. JACOB, CH., Notice nécrologique sur M. Jacques de Lapparent: Acad. Sci. Paris Comptes rendus, vol. 226, no. 24, pp. 1933–1935. (No. 392 for the year 1948).

KEEN, A. MYRA, see SCHENK, E. T. and MCMASTERS, J. H.

461. KING, PHILIP B., Geology of the southern Guadalupe Mountains, Texas: U. S. Geol. Survey Prof. Paper 215, 183 pp., 23 pls., 24 figs. (No. 343 for the year 1948).

LEONTOVICH, G. E., see PUTRJA, F. S., and LEONTOVICH, G. E.

462. LIZAUR, J. DE, Datos para el estudio de la microfauna de Maruecos: Inst. geol. min. España Notas y Comun., no. 18, pp. 97–99, 7 text-figs. (No. 344 for the year 1948).

463. LUGEON, M., and VUAGNAT, M., Quelques considérations sur le flysch du subassement de la Dent du Morcles: Soc. vaudoise sci. nat. Bull., vol. 64, no. 272, pp. 85–100. (No. 345 for the year 1948).

464. MACPHERSON, ERIC O., The upper Senonian transgression in New Zealand. (Addendum on microfaunal evidence and correlations by H. J. FINLAY): New Zealand Jour. Sci. Technology, vol. 30, pp. 280–296, 1 pl., 1 fig. (No. 346 for the year 1948).

465. MAJZON, LASZLO, *Centenarina* nov. gen. es *Cassidulina vitalisi* nov. sp. a budai alsorupeli retegekböl: Foldtany Közlöny, vol. 78, pp. 22–25, 1 fig. (No. 347 for the year 1948).

466. MASON, B., Tertiary strata at Smite River, Lake Heron, New Zealand: New Zealand Jour. Sci. Technology, sect. B, vol. 30, pp. 55–58. (No. 348 for the year 1948).

467. MAXIA, C., Giuseppe Checchia-Rispoli: Soc. geol. Ital., Boll., vol. 66 (1947), Roma 1948, pp. xv–xxxiii, 1 portrait, bibliography. (No. 349 for the year 1948).

MCMASTERS, JOHN H., see SCHENK, E. T., and MCMASTERS, J. H.

468. MIKHAILOV, A. E., New data on the stratigraphy of the eastern Alai, USSR. (In Russian): Moscou Soc. Naturalistes, Bull., geol. sect., vol. 23, pp. 67–78, 3 figs. (No. 350 for the year 1948).

469. MORET, LÉON, Manuel de Paléontologie animale. 2nd edition, Masson & Cie. Paris, 745 pp., 12 tables, 274 figs. (Foraminifera: pp. 40–112, text-figs. 5–39, tables II, III. (No. 351 for the year 1948).

470. MOROZOVA, V. G., Foraminifera from the Lower Cretaceous deposits in the region of Sotchi, southwestern Caucasus. (In Russian): Moskovsk. Obshch. Ispytatel, Prirody, Bjull., otdel geol., vol. 23, no. 3, pp. 23–43, 2 pls. (No. 352 for the year 1948).

MULLER, SIEMON W., see SCHENK, E. T., and MCMASTERS, J. H.

471. NOWAK, JAN, Miocen polnocnej krawedzi Karpat. The Miocene of the northern border of the Carpathians: Ann. Soc. géol. Pologne, vol. 17, 1947, Cracovie 1948, 38 pp. (No. 353 for the year 1948).

472. PASTIELS, ANDRÉ, Contribution à l'étude des microfossiles de l'Eocène belge: Mus. Roy. Nat. Belgique Mém. 109, 77 pp., 6 figs., 6 pls. (Foraminifera: p. 62). (No. 354 for the year 1948).

473. PUTRJA, F. S., and LEONTOVICH, G. E., Contribution to the study of the Fusulinidae of the Middle Carboniferous in the Volgian region of Saratov. (In Russian): Moskovsk. Obshch. ispytatel Prirody, Bjull., otdel geol., vol. 23, no. 4, pp. 11–45, 4 pls. (No. 355 for the year 1948).

474. RADNOTY, EGON, Observations géologiques dans la partie méridionale du bassin ligniteux de Borsod en Hongrie (Hungarian with summary in French): Földtani Közlöny, vol. 78, pp. 121–126, 2 figs. (No. 356 for the year 1948).
475. RAO, S. R. N., On the species of Foraminifera figured by Kossmat (1897) from Pondicherry, S. India: Indian Sci. Congress, 34th, Delhi, 1947, Proc. pt. 3, Calcutta 1948, p. 144. (No. 357 for the year 1948).
476. REITLINGER, E. A., Cambrian Foraminifera from Yakutsk (In Russian): Soc. Natural. Moscou Bull., vol. 53, sect. géol., vol. 23, no. 2, pp. 77–81, 6 text-figs. (No. 358 for the year 1948).
477. SAMSONOWICZ, J., Cretaceous deposits in the bore-holes of Lodz, and the structure of the Lodz basin. (Polish with summary in English): Panst. Inst. Geol. Warszawa Biul., no. 50, pp. 1–47. (No. 359 for the year 1948).
478. SCHENK, EDWARD T., and MCMASTERS, JOHN H., Procedure in taxonomy, including a reprint in translation of the Règles Internationales de la Nomenclature Zoologique (International Code of Zoological Nomenclature) with titles of and notes on the Opinions rendered to the present date (1907 to 1947). Revised and enlarged edition, in part rewritten by A. MYRA KEEN and SIEMON W. MULLER: Stanford, Calif., Stanford Univ. Press. 93 pp. (No. 360 for the year 1948).
479. SEMIKHATOVA, S. V., Geological age of the upper beds of Panikskaja of the Don Carboniferous (In Russian): Akad. Nauk S.S.S.R., ser. geol., Izvest. no. 3, pp. 143–146. (No. 361 for the year 1948).
480. SETTERINGTON, D. T., Palaeontological geology. (IV): Petroleum (Great Britain), vol. 11, July 1948, pp. 153–155, 170. (No. 362 for the year 1948).
481. SETTERINGTON, D. T., Palaeontological geology. (IX): ibid., vol. 11, p. 276. (No. 363 for the year 1948).
482. SILVESTRI, ALFREDO, Foraminiferi del Cretaceo della Somalia: Supplemento: Palaeontogr, Italica, Pisa, vol. 32, suppl. VI, pp. 63–93, pls. 7–9 (15–17). (No. 364 for the year 1948).
483. SILVESTRI, ALFREDO, Foraminiferi dell'-Eocene della Somalia. Parte III, fasc. 2: ibid., vol. 32, suppl. 6, pp. 1–56 (277–332), pls. i–5 (32–34). (No. 365 for the year 1948).
484. SYNIEWSKA, J., in: LYCZEWSKA, J., Report of the geological investigations in the NW corner of Brzesko Nowe, map 1/100000 (Carpathian foreland): Serv. géol. Pologne Bull., vol. 42, pp. 46–75. (No. 366 for the year 1948).
485. SZALANCZI, GYORGI, Geological contributions from the Somogy region. (In Hungarian): Földanti Közlöny, vol. 78, pp. 80–94, 1 text-fig., 1 table. (No. 367 for the year 1948).
486. SZOTS, ENDRE K., The Eocene formations of the northern Bakony. (In Hungarian): ibid., vol. 78, pp. 39–59, 3 text-figs., 1 table. (No. 368 for the year 1948).
487. SZUROVY, GEZA, Erdgeschichtliche und geotektonische Entwicklung der grossen ungarischen Tiefebene. (Hungarian and German text): ibid., vol. 78, pp. 206–216, 6 text-figs. (No. 369 for the year 1948).
488. TURNOVSKY, K., Arbeitsmethoden der angewandten Mikropaläontologie: Mikroskopie (Oesterreich), vol. 3, pp. 181–188, 2 text-figs. (No. 370 for the year 1948).
489. VAŠIČEK, MILOSLAV, *Planularia antillea* (Cushman, 1923), a jeji varieta v moravskem tortom. (In Czech): Casop. Vlast. Spol. Mus. Olomouci, vol. 57, pp. 1–3, 2 text-figs. (No. 371 for the year 1948).
490. VENDEL, M., Vitális Istvan emlekezete: Földanti Közlöny, vol. 78, pp. 3–16. (No. 372 for the year 1948).
491. VISSE, L., Contribution à l'étude petrographique des phosphates marocains: Soc. géol. France Bull., ser. 5, vol. 19, pp. 675–684 (No. 373 for the year 1948).
VUAGNAT, M. See LUGEON, M. and VUAGNAT, M.
492. WELLMAN, H. W., and others, The outline of the geology of New Zealand (to accompany the 16 mile to 1 inch geological map): Dept. Sci. Industr. Res., Wellington, 47 pp. (Chapter on Upper Cretaceous and Tertiary by H. J. FINLAY). (No. 374 for the year 1948).
493. YABE, HISAKATSU, Neoschwagerininae Dunbar and Condra: Japan. Acad. Tokyo Proc., vol. 24, No. 9, pp. 1–9, 2 tables. (No. 375 for the year 1948).

ERRATA REGARDING PRECEDING SUPPLEMENTS

After typing the manuscript and re-arranging the respective cards in the card-index of the compiler, it was found that the following publications had already been listed in previous bibliographies in this JOURNAL. The following 14 titles should, therefore, be erased from the list: Lit. nos. *367* (1941); *371* (1942); *386* (1943); *389* (1944); *391*, *393*, and *395* (1945); *399*, *403*, and *404* (1946); *424*, *438*, and *439* (1947); and *447* (1948).

GENERAL INDEX

(The numbers refer to publications of the preceding Bibliography.)

General: 19, 101, 103, 143, 146–148, 157, 163, 167, 190, 206, 207, 214, 221–223, 227, 228, 237, 257, 270, 271, 274, 287, 293, 306, 316, 328, 343, 347, 394, 452, 487
Activities (News): 26, 27, 40, 57–59, 63–65, 67, 85, 86, 96, 122, 123, 131, 139, 161, 162, 175, 195, 208, 210, 213, 215, 233–236, 242, 243, 246, 291, 335, 336, 338.
Applied Micropaleontology: 19, 38, 143, 167, 237, 480, 481, 488.

Bibliographies: 60, 70, 133, 140, 149, 175, 182, 195, 299–301, 315, 321, 443.
Biographies and Necrologies: 43, 87, 92, 98, 115, 137, 149, 150, 155, 156, 158, 177, 212, 261, 269, 303, 304, 320, 332, 339, 356, 361, 362, 378, 413, 430, 446, 448, 455, 458, 460, 467, 490.
Biology: 422, 491.
Brackish Water Foraminifera: 55, 138, 219.
Catalogues and Lists: 102–104, 140, 173, 174, 274, 299–301, 397.
Correlation by Foraminifera: 19, 30, 36, 42, 90, 117, 136, 146, 169, 180, 181, 189, 207, 221, 222, 231, 255, 272, 314, 333.
Distribution of Foraminifera: 30, 36, 39, 169, 197–200, 216, 221, 222, 231, 255, 272, 282, 287, 288, 307, 308, 309, 314, 324, 325, 327, 333, 342, 344, 450a.
Ecology: 20, 148, 159, 172, 175, 216, 221, 222, 227, 231, 282, 285, 287, 288, 346, 394, 422, 442.
Evolution and Phylogeny: 109, 132, 193a, 203, 273, 275, 277.
Facies: 46–52, 130, 134, 146, 148, 172, 216, 231, 281, 282, 285.
Handbooks: 157, 167, 223, 294, 469.
Methods and Technique: 44, 94, 99, 100, 110, 125, 142, 146, 167, 209, 238, 262, 276, 284, 324, 325, 401, 407, 478, 488.
Monographs: 13, 30, 35, 68, 69, 71–80, 84, 142, 145, 165, 171, 180, 187, 193, 252, 253, 258, 260, 279, 296, 317, 319, 330, 342, 344, 357, 359, 360, 370, 372, 379, 383, 388, 428, 449, 450, 470, 473, 482, 483.
Morphology and Anatomy: 15, 17, 109, 116, 187, 193, 193a, 205, 251, 252, 344, 381, 441.
Paleobiology-Paleoecology: 134, 148, 159, 216, 405.
Paleogeography: 31, 36, 89, 180.
Problematica: 337.
Reworked Foraminifera: 48, 205, 312, 341.
Size of Foraminifera: 311.
Stratigraphic Range (families); 313.
Systematics (Nomenclature, Taxonomy, etc.): 9, 11, 14, 16, 21–23, 29, 30, 35, 37, 40, 61, 66, 71–80, 84, 88, 102–104, 109, 111, 116, 124, 128, 129, 133, 141, 142, 145, 165, 170, 171, 180, 186, 187, 192, 193, 205, 239, 244, 248–253, 257, 258, 260, 273, 279, 283, 289, 296, 302, 305, 310, 317, 319, 330, 334, 344, 349, 353, 354, 359, 360, 372, 379–383, 388, 420, 436, 441, 444, 449, 450, 459, 465, 470, 473, 475, 476, 478, 482, 483, 489, 493.

STRATIGRAPHIC INDEX

Cambrian: 476.
Carboniferous: 20, 33, 152, 169, 189, 190, 194, 205, 240, 253, 258, 266, 268, 318, 352–354, 359, 360, 385, 398, 408, 428, 434, 468, 473, 479.
Permo-Carboniferous: 37, 323.
Permian: 5, 129, 144, 204, 205, 265, 317, 319, 420, 423, 461.
Triassic: 217.
Liassic: 18, 166, 178, 206, 316, 328, 347, 425.
Jurassic: 36, 73, 153, 160, 163, 166, 220, 254, 255, 342, 358, 425.
Lower Cretaceous: 23, 32, 36, 49–51, 91, 93, 117, 135, 154, 166, 170, 171, 180, 220, 280, 292, 373, 405, 406, 470, 477.
Upper Cretaceous: 12, 17, 22, 32, 42, 46, 47, 52, 56, 69, 84, 88, 90, 91, 93, 97, 106, 113, 114, 118, 119, 121, 135, 142, 164, 166, 168, 176, 187, 188, 196, 211, 218, 241, 247, 248, 251, 252, 255, 256, 259, 263, 271, 272, 275, 280, 289, 295, 307, 308, 323, 325, 331, 344, 345, 392, 405, 417, 450, 464, 482, 492.
Tertiary (comprehensive): 24, 30, 31, 84, 136, 151, 176, 357, 388, 411, 450a, 466, 492.
Paleocene: 2, 3, 31, 54, 81, 89, 112, 141, 224, 255, 271, 307, 308, 323.
Eocene: 4, 13, 15, 16, 25, 30, 31, 39, 61, 66, 72, 74, 76, 77, 82, 84, 95, 107, 109, 113, 116, 120, 121, 127, 135, 145, 165, 168, 183, 185, 191, 230, 232, 250, 255, 263, 267, 280, 281, 286, 287, 289, 290, 295, 298, 309, 314, 325, 329, 331, 340, 348, 350, 351, 377, 387, 410, 418, 421, 431, 432, 433, 436, 441, 444, 449, 450, 454, 463, 472, 483.
Oligocene: 13, 29–31, 39, 53, 84, 127, 128, 135, 147, 184, 186, 196, 245, 263, 273, 282, 348, 375, 433, 436, 451, 465.
Oligo-Miocene: 109, 249, 433.
Miocene: 1, 7, 8, 11, 30, 31, 35, 62, 83, 84, 135, 146, 192, 196, 229, 231, 279, 282, 287, 295–297, 323, 324, 330, 331, 370, 375, 376, 388, 396, 402, 410, 432, 456, 459, 471, 474, 485, 486, 489.
Pliocene: 6, 7, 9, 30, 35, 75, 207, 219, 282, 287, 322, 337, 379, 382, 383, 388, 419, 459.
Pleistocene: 30, 45, 105, 179, 193, 202, 207, 216, 219, 221, 222, 227, 278, 287, 322, 333, 334, 382, 388, 440, 442, 457.
Subrecent: 440.
Recent: 37, 55, 69, 172, 197–201, 225, 226, 260, 287, 329, 380, 394, 407.

GEOGRAPHIC INDEX

AMERICA
Central America: Cuba: 71, 180, 249, 250, 314; *Dominican Republic:* 30; *Guatemala:* 355; *Mexico:* 5, 91, 127, 180, 263, 264, 344, 405; *Nicaragua:* 449; *Panama:* 29, 66, 348.
North America: Alabama: 13, 15, 16, 318; *Arizona:* 292; *Arkansas:* 69, *California:* 55, 117, 120, 288, 340, 410; *Canada:* 164, 217, 345; *Florida:* 180; *Georgia:* 181; *Greenland:* 363, 366; *Kansas:* 170, 189; *Louisiana:* 145, 146, 231, 279; *Mississippi:* 318; *Montana:* 160; *New Jersey:* 181; *New Mexico:* 426; *North Dakota:* 400; *Oklahoma:* 171; *Oregon:* 74, 288, 412; *Pennsylvania:* 427; *Texas:* 109, 118, 119, 147, 171, 245, 461; *Utah:* 349, 398; *Virginia:* 72; *Washington:* 75, 288.
South America: Barbados: 39; *Colombia:* 319, 374; *Ecuador:* 281; *Peru:* 76, 77, 109, 144, 204, 205, 219, 258, 289, 290; *Tobago Island:* 37; *Trinidad:* 39; *Venezuela:* 61, 97, 180, 224, 314, 319, 450; *West Indies (general):* 89.
AFRICA
General: 54, 112, 176; *Algeria:* 88, 93, 193, 193a, 271, 272; *Egypt:* 81, 168, 260, 282, 324, 325; *Morocco:* 297, 462, 491; *Gold Coast:* 453; *Somalia:* 444, 482, 483; *Tunisia:* 6, 53.
ASIA
Burma: 25; *China:* 420, 423, 437; *Formosa (Taiwan):* 380, 383, 459; *India:* 89, 116, 232, 298, 475; *Indochina:* 265, 266; *Iran:* 121; *Japan:* 7–9, 11, 129, 151, 192, 322, 364, 365, 372, 373, 379–383, 388, 459; *Middle East (general):* 134; *Palestine:* 12; *Philippine*

Islands: 128, 411, 451; *Syria:* 255, 256; *Turkey:* 32, 106, 295, 296, 323, 324, 355, 445; *USSR (Asiatic, and Siberia)*: 169, 350, 357, 408, 468, 470, 476.

EUROPE

Albania: 433; *Austria:* 376, 387, 396; *Belgium:* 69, 472; *Bulgaria:* 220, 370, 384; *Cyprus:* 135, 255; *Crete:* 255; *Czechoslovakia:* 229, 230, 259, 330, 331, 431, 432, 489; *Denmark:* 333; *England:* 17, 18, 23, 33, 90, 163, 206, 316, 328, 333, 347; *France:* 2, 3, 49, 50, 51, 52, 82–84, 95, 107, 165, 166, 178, 191, 218, 241, 267, 273, 358; *Germany:* 20, 22, 23, 28, 31, 36, 136, 196, 268, 425; *Greece:* 248, 251, 255, 256; *Holland:* 45, 141, 142, 333, 334, 337; *Hungary:* 377, 402, 465, 474, 485–487; *Ireland:* 333; *Italy:* 34, 56, 105, 109, 114, 179, 211, 254, 286, 375, 390, 392, 409, 418, 421, 429, 435, 440; *Istria:* 368; *Norway:* 333; *Poland:* 73, 126, 154, 414–416, 456, 471, 477, 484; *Scotland:* 333; 442; *Spain:* 4, 62, 419; *Sweden:* 42, 333, 457; *Switzerland:* 113, 187, 1888, 247, 252, 280, 341, 342, 351, 454, 463; *USSR (European part, and Caucasus)*: 152, 194, 240, 253, 330, 352–354, 359, 360, 369, 385, 406, 428, 434, 436, 473, 479.

OCEANIA

Australia: 309, 450a; *Billiton:* 202; *Borneo:* 184, 186; *Indonesia (general)*: 197–202, 329; *Java:* 1, 35, 183, 185; *New Zealand:* 24, 108, 309, 464, 466, 492; *Sumatra:* 278; *Timor:* 317, 441.

OCEANS

Atlantic: 226, 287; *Caribbean Sea (and Gulf of Mexico)*: 37, 172, 225; *East Indian Archipelago:* 197–201; *Mediterranean Sea:* 407; *Pacific:* 380; *Red Sea:* 260.

INDEX TO NEW GENERA, SPECIES, AND VARIETIES OF FORAMINIFERA FOR THE YEAR 1949

ACERVOSCHWAGERINA Hanzawa, Jour. Paleontology, vol. 23, p. 207. New subgenus of *Paraschwagerina* Dunbar and Skinner, 1936. Family Fusulinidae; Subfamily Schwagerininae. Lowest Permian. Subgenotype: *Acervoschwagerina endoi* Hanzawa, 1949, Jour. Paleontology, vol. 23, p. 208, pl. 43, figs. A–D; text-figs. 2, 3, from Lower Permian, Japan.

Acervoschwagerina see *Paraschwagerina*

ACOSTINA Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 152. New genus of the family Lagenidae. Genotype: *Chrysalogonium pyramidale* Acosta, 1940, Torreia (Habana), no. 5, p. 4, pl. 1, figs. 4, 5; Recent, Cuba. Upper Oligocene and Recent.

Alabamina haitiensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 273, pl. 21, figs. 7–9. Lower Eocene, Haiti.

—— *scitula* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 89, pl. 14, fig. 6. Lower Oligocene, Alabama.

Allomorphina conica Cushman and Todd, Cushman Lab. Foram. Res. Contr., vol. 25, p. 62, pl. 11, fig. 8. Upper Cretaceous, Trinidad, B.W.I. (hic synonymia)

—— *pacifica* Cushman and Todd, ibid., vol. 25, p. 68, pl. 12, figs. 6–9. Pliocene, Fiji. (hic synonymia).

Ammobaculites euides Loeblich and Tappan, Jour. Paleontology, vol. 23, p. 250, pl. 46, fig. 8. Lower Cretaceous, Oklahoma.

—— *flariformis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 27, pl. 3, fig. 4. Upper Eocene, Alabama.

—— *obesum* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 51, pl. 1, figs. 16, 17. Upper Oligocene, Dominican Republic.

—— *obliquus* Loeblich and Tappan, Jour. Paleontology, vol. 23, p. 250, pl. 46, figs. 4, 5. Lower Cretaceous, Texas.

—— *pseudorostratus* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 27, pl. 3, fig. 7. Upper Eocene, Alabama.

—— *subagglutinans* Bandy, ibid., vol. 32, no. 131, p. 27, pl. 3, fig. 5. Lower Oligocene, Alabama.

—— *torosus* Loeblich and Tappan, Jour. Paleontology, vol. 23, p. 251, pl. 46, figs. 6, 7. Lower Cretaceous, Texas.

—— *viaensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 52, pl. 1, figs. 12–15. Upper Oligocene, Dominican Republic.

—— *viriosus* Loeblich and Tappan, Jour. Paleontology, vol. 23, p. 251, pl. 47, fig. 1. Lower Cretaceous, Texas.

—— *yasicaensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 52, pl. 1, figs. 22–25. Middle Miocene, Dominican Republic.

—— *yazooensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 28, pl. 3, fig. 6. Upper Eocene, Alabama.

—— *yumotoensis* Asano, Jour. Paleontology, vol. 23, p. 474, text-fig. 1, no. 1a, b. Upper Oligocene, Japan.

Ammodiscus dominicensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 48, pl. 1, figs. 49, 50. Upper Oligocene, Dominican Republic.

—— —— —— var. *deformis* Bermudez, ibid. Spec. Pub. 25, p. 48, pl. 1, figs. 51, 52. Upper Oligocene, Dominican Republic.

—— *rotalarius* Loeblich and Tappan, Jour. Paleontology, vol. 23, p. 247, pl. 46, fig. 1. Lower Cretaceous, Oklahoma.

Ammomarginulina brevilingulata Smith, Louisiana Geol. Surv. Bull. 26, p. 50, pl. 9, figs. 7, 8. Middle Miocene, Louisiana.

—— *decorata* Hussey, Jour. Paleontology, vol. 23, p. 118, pl. 25, figs. 1, 2. Middle Eocene, Louisiana.

—— *loricata* Loeblich and Tappan, ibid., vol. 23, p. 249, pl. 46, fig. 15. Lower Cretaceous, Texas.

Amphistegina canaensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 262, pl. 19, figs. 16–18. Basal middle Miocene, Dominican Republic.

—— *guraboensis* Bermudez, ibid., Spec. Pub. 25, p. 263, pl. 19, figs. 10–12. Middle Miocene, Dominican Republic.

—— *radiata* (Fichtel and Moll, 1798) var. *papillosa* Said, ibid., Spec. Pub. 26, p. 39, pl. 4, fig. 12. Recent, northern Red Sea, 941 m. (For: *Amphistegina radiata* (Fichtel & Moll) in:

Cushman, 1924, Carnegie Inst. Washington Pub. 342, p. 49, pl. 17, fig. 2 (non fig. 1), and in: Hofker, 1930, Résult. Scient. Voyage Indes Néerland., vol. 2, p. 6, pl. 1, figs. 8–10; and for: *Amphistegina lessonii* Dakin, 1906, (non d'Orbigny), Rept. Ceylon Pearl Oyster Fish., vol. 5, p. 240, pl. 1, fig. 13.)

—— *taberana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 264, pl. 19, figs. 13–15. Middle Oligocene, Dominican Republic.

Angulogerina azuana Bermudez, ibid., Spec. Pub. 25, p. 213, pl. 13, fig. 67. Lower Miocene, Dominican Republic.

—— *cuyleri* Izgi (Tasman), Maden tetk. ve Arama Enstit. Yayinl. Ankara, (B), No. 15, p. 39, pl. 6, fig. 7. Miocene, Turkey.

—— *delicatula* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 214, pl. 13, fig. 68. Lower Miocene, Dominican Republic.

—— *eximia* Cushman and Jarvis, 1936, var. *quitacorazana* Bermudez, ibid., Spec. Pub. 25, p. 215, pl. 13, fig. 60. Upper Oligocene, Dominican Republic.

—— —— —— var. *striatissima* Bermudez, ibid., Spec. Pub. 25, p. 215, pl. 13, fig. 62. Upper Miocene, Dominican Republic.

—— —— —— var. *sublaevigata* Bermudez, ibid., Spec. Pub. 25, p. 215, pl. 13, fig. 63. Middle Miocene, Dominican Republic.

—— —— —— var. *transitoria* Bermudez, ibid., Spec. Pub. 25, p. 215, pl. 13, fig. 61. Middle Miocene, Dominican Republic

—— *guazumalensis* Bermudez, ibid., Spec. Pub. 25, p. 216, pl. 13, fig. 70. Upper Oligocene, Dominican Republic.

—— *guraboensis* Bermudez, ibid., Spec. Pub. 25, p. 216, pl. 13, fig. 58. Middle Miocene, Dominican Republic.

—— *inflata* Hussey, Jour. Paleontology, vol. 23, p. 133, pl. 27, fig. 2. Middle Eocene, Louisiana.

—— *kokozuraensis* Asano, ibid., vol. 23, p. 428, text-fig. 1, nos. 50–53. Miocene, Japan.

—— *multistriata* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 217, pl. 13, fig. 64. Middle Miocene, Dominican Republic.

—— —— —— *heterosculpta* Bermudez, ibid., Spec. Pub. 25, p. 217, pl. 13, fig. 65. Upper Miocene, Dominican Republic.

—— *subdecorissima* Bermudez, ibid., Spec. Pub. 25, p. 218, pl. 13, fig. 69. Upper Oligocene, Dominican Republic.

—— *yaquensis* Bermudez, ibid., Spec. Pub. 25, p. 219, pl. 13, fig. 66. Middle Miocene, Dominican Republic.

Anomalina abuillotensis Bermudez, ibid., Spec. Pub. 25, p. 288, pl. 22, figs. 47–49. Lower Eocene, Haiti.

—— *auris* Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 43, pl. 4, figs. 66–68. Middle Eocene (Lutetian), Paris Basin, France.

—— *bradyi* Said, nom. nov., Cushman Lab. Foram. Res. Spec. Pub. 26, p. 41, pl. 4, fig. 2. Recent, northern Red Sea, 80–512 m. (For: *Anomalina ammonoides* Reuss in: Brady, 1884, Rept. Voyage Challenger, Zool. vol. 9, p. 672, pl. 94, figs. 2, 3; and in: Cushman, 1921, U.S. Nat. Mus. Bull. 100, pt. 4, p. 323, pl. 61, fig. 1.)

—— *globosa* Boomgaart, Proefschr. (Thesis) Rijks-Univ. Utrecht, p. 149, pl. 14, fig. 8. Miocene, East Java. (Cave: *Anomalina globulosa* Chapman and Parr 1937).

—— *inversa* Boomgaart, ibid., p. 149, pl. 13, fig. 7. Mio-Pliocene, East Java.

—— *margaritifera* Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 44, pl. 4, figs. 60–62. Lutetian (middle Eocene), Paris Basin, France.

Arenobulimina jurassica Cushman and Glazewski, Cushman Lab. Foram. Res. Contr., vol. 25, p. 8, pl. 2, figs. 17, 18. Upper Jurassic, Poland.

Articulina baitoensis Bermudez, ibid., Spec. Pub. 25, p. 109, pl. 6, fig. 40. Lower Miocene, Dominican Republic.

—— *cibaoensis* Bermudez, ibid., Spec. Pub. 25, p. 109, pl. 6, fig. 38. Lower Miocene, Dominican Republic.

—— *dominicana* Bermudez, ibid., Spec. Pub. 25, p. 110, pl. 6, fig. 33. Middle Miocene, Dominican Republic.

—— *incrassata* Bermudez, ibid., Spec. Pub. 25, p. 110, pl. 6, fig. 41. Middle Eocene, Dominican Republic.

—— *maoensis* Bermudez, ibid., Spec. Pub. 25, p. 111, pl. 6, fig. 39. Middle Miocene, Dominican Republic.

—— *oligocenica* Cuvillier and Szakall, Foram. d'Aquitaine, pt. 1, p. 41, pl. 18, fig. 11. Oligocene (Stampian), France.

Assilina arenensis Almela, Inst. geol. min. España Notas y Comun., no. 19, p. 11, pl. 1, figs. 1–8. Lower Eocene, Northern Spain.

—— *subarenensis* Almela, ibid., no. 19, p. 12, pl. 1, figs. 9–17. Lower Eocene, Northern Spain.

Astacolus complanatus Hussey, Jour. Paleontology, vol. 23, p. 125, pl. 26, fig. 17. Middle Eocene, Louisiana.

Asterigerina guraboensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 265, pl. 19, figs. 34–36. Middle Miocene, Dominican Republic.

ASTERIGERINATA Bermudez, ibid., Spec. Pub. 25, p. 266. New genus of the family Amphisteginidae. Genotype: *Asterigerinata dominicana* Bermudez, 1949, ut infra. Middle Miocene.

—— *dominicana* Bermudez, ibid., Spec. Pub. 25, p. 266, pl. 19, figs. 37–39. Middle Miocene, Dominican Republic.

ASTERIGERINELLA Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 118. New genus of the family Asterigerinidae. Upper Eocene. Genotype: *Asterigerinella gallowayi* Bandy, 1949, ut infra.

—— *gallowayi* Bandy, ibid., vol. 32, no. 131, p. 118, pl. 22, fig. 1. Upper Eocene, Alabama.

Baggina dominicana Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 260, pl. 18, figs. 37–39. Middle Miocene, Dominican Republic.

—— *papillostoma* Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 35, pl. 5, figs. 75–77. Lutetian (middle Eocene), Paris Basin, France.

Bathysiphon abuillotensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 47, pl. 1, figs. 3, 4. Lower Eocene, Haiti.

—— *nodulosus* Bermudez, ibid., Spec. Pub. 25, p. 47, pl. 1, fig. 5. Lower Eocene, Haiti.

Bermudezina aminaensis Bermudez, ibid., Spec. Pub. 25, p. 69, pl. 3, figs. 17, 18. Middle Miocene, Dominican Republic.

—— *dominicana* Bermudez, ibid., Spec. Pub. 25, p. 70, pl. 3, figs. 27, 28. Middle Miocene, Dominican Republic.

—— *maoensis* Bermudez, ibid., Spec. Pub. 25, p. 70, pl. 3, figs. 19–22. Lower Miocene, Dominican Republic.

Bigenerina dominicana Bermudez, ibid., Spec. Pub. 25, p. 60, pl. 3, figs. 3, 4. Upper Oligocene, Dominican Republic.

Biglobigerinella algeriana ten Dam and Sigal, Soc. géol. France Comptes rendus, fasc. 11, p. 235, text-figs. 1–3. Upper Cretaceous, Algeria.

Bitubulogenerina azuana Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 198, pl. 12, figs. 57, 58. Lower Miocene, Dominican Republic.

—— *breviata* Said, ibid., Spec. Pub. 26, p. 30, pl. 3, fig. 16. Recent, northern Red Sea, 80–433 m.

Bolivina basisenta Cushman and Stone, 1947, var. *oregonensis* Cushman, R. E. Stewart and K. C. Stewart, Oregon Dept. Geol. and Min. Industr. Bull. 36, pt. 6, p. 133, pl. 15, fig. 7. Upper Eocene, Oregon.

—— *cancellata* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 188, pl. 12, fig. 38. Upper Oligocene, Dominican Republic.

—— *chehalisensis* nom. nov., Rau, Jour. Paleontology, vol. 23, p. 441. New name for: *Bolivina astoriensis* Rau, 1948, Jour. Paleontology, vol. 22 p. 778, pl. 119, fig. 7, non *B. astoriensis* Cushman, Stewart and Stewart, 1948, Oregon Dept. Geol. and Min. Industr. Bull. 36, pt. 2, p. 47, pl. 6, fig. 3. Lower Miocene, Washington.

—— *denticulata* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 126, pl. 25, fig. 3. Eocene (Claiborne), Alabama. [NOTE: Preoccupied by: *Bolivina granti* Rankin, 1934, var. *denticulata* Cushman and Stevenson, 1948, Cushman Lab. Foram. Res. Contr. vol. 24, p. 59, pl. 9, fig. 37].

—— *dohmi* Bermudez, Cushman Lab. Foram. Res., Spec. Pub. 25, p. 189, pl. 12, fig. 28. Middle Miocene, Dominican Republic.

—— *gardnerae* Cushman, 1926, var. *lineata* Cushman and Cederstrom, Virginia Geol. Surv. Bull. 67 (1945; published April 15, 1949) p. 28, pl. 4, fig. 11. Upper Eocene, Virginia.

—— *gasparensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 190, pl. 12, figs. 33, 34. Upper Oligocene, Dominican Republic.

—— *hebes* Macfadyen, 1931, var. *suezensis* Said, ibid., Spec. Pub. 26, p. 28, pl. 3, fig. 9. Recent, Red, Sea, Gulf of Suez, 64 m.

—— *ignara* Cushman and Stone, ibid., Contr., vol. 25, p. 54, pl. 10, figs. 3, 4. Middle Eocene, Peru.

—— *insueta* Cushman and Stone, ibid., Contr., vol. 25, p. 53, pl. 10, figs. 1, 2. Middle Eocene, Peru.

—— *profunda* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 110, pl. 11, fig. 9. Miocene, East Java.

—— *pseudogemma* Boomgaart, ibid., p. 111, pl. 11, fig. 10. Pliocene, East Java. [For: *Bolivina gemma* Le Roy, 1939 (non Cushman, 1937), Natuurkund. Tijdschr. Nederl.-Indie, vol. 99, p. 246, pl. 5, figs. 12, 13.]

—— *retifera* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 128, pl. 24, fig. 10. Upper Eocene, Alabama.

—— *robusta* Brady, 1881, var. *pacifica* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 112, pl. 12, fig. 3. Pliocene, East Java. [NOTE: Varietal name preoccupied by: *Bolivina acerosa* Cushman, 1936, var. *pacifica* Cushman and McCulloch, 1942, Allan Hancock Pacific Exped., vol. 6, no. 4, p. 185, pl. 21, figs. 2, 3; Recent, Gulf of California, off Mexico coast].

—— *salebrosa* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 129, pl. 25, fig. 6. Upper Eocene, Alabama.

—— *striata* Hussey, Jour. Paleontology, vol. 23, p. 134, pl. 27, figs. 18, 19. Middle Eocene, Louisiana. [NOTE: Species name preoccupied by *Bolivina hungarica* (Vadasz, 1911) var. *striata* (Vadasz, 1911) Res. Wiss. Erforsch. Balatonsee, p. 16. (olim: *Bifarina*), vol. 1, pt. 1, Palaeont. Anhang, pl. 1, fig. 10].

—— *striatellata* nom. nov. Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 129, pl. 24, figs. 8, 9. Upper Eocene, Alabama. [New name for: *Bolivina jacksonensis* Cushman and Applin, 1926, var. *striatella* Cushman and Applin, 1926, Am. Assoc. Petroleum Geologists Bull., vol. 10, p. 167, pl. 7, figs. 5, 6, non *Bolivina advena* Cushman, 1925, var. *striatella* Cushman, 1925, Cushman Lab. Foram. Res. Contr., vol. 1, p. 30, pl. 5, fig. 3.]

—— *subspathulata* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 112, pl. 12, fig. 4. Pliocene, East Java.

—— *superba* Emiliani, Riv. Ital. di Pal. e Strat., vol. 55, fasc. 1, reprint p. 6, pl. 1, fig. 1. Lower Pleistocene (Calabrian), Italy.

—— *virginiana* Cushman and Cederstrom, Virginia Geol. Surv. Bull. 67, (1945; published April 15, 1949), p. 28, pl. 4, fig. 12. Upper Eocene, Virginia. [NOTE: This species was pre-published by Cushman, 1948, State of Maryland Board of Nat. Resources, Dept. Geol. etc., Bull. 2, p. 236, pl. 18, fig. 23. Eocene, Maryland].

Bolivinita elegantissima Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 95, pl. 11, fig. 3. Pliocene, East Java.

Borelis philippinensis Hanzawa, Japanese Jour. Geology and Geography, vol. 21, p. 156, pl. 4, figs. 1–7. Aquitanian (uppermost Oligocene, or basalmost Miocene), Luzon, Philippine Islands.

BUCCICRENATA Loeblich and Tappan, Jour. Paleontology, vol. 23, p. 252. New genus of the family Lituolidae, subfamily Lituolinae.

Genotype: *Ammobaculites goodlandensis* Vanderpool, 1933, Jour. Paleontology, vol. 7, p. 407, pl. 49, figs. 1–3. Lower Cretaceous.

Bulimina aseriata Emiliani, Rev. Ital. di Pal. e Strat., vol. 55, fasc. 1, reprint p. 8, pl. 1, fig. 10. Lower Pleistocene (Calabrian), Italy.

—— —— —— var. *pseudospinosa* Emiliani, ibid., vol. 55, fasc. 1, reprint p. 7, pl. 1, fig. 3. Lower Pleistocene (Calabrian), Italy.

—— *dominicana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 181, pl. 12, fig. 4. Upper Oligocene, Dominican Republic.

—— *elegans* d'Orbigny, 1826, var. *subspinosa* Emiliani, Riv. Ital di Pal. Strat., vol. 55, fasc. 1, reprint p. 7, pl. 1, figs. 2, 4–9. Lower Pleistocene (Calabrian), Italy.

—— *evexa* Loeblich and Tappan, Jour. Paleontology, vol. 23, p. 263, pl. 51, fig. 5. Lower Cretaceous, Oklahoma. [For: *Bulimina nannina* Tappan, 1943 (non Tappan, 1940), Jour. Paleontology, vol. 17, p. 507, pl. 81, fig. 15].

—— (*Desinobulimina*) *expansa* Cushman and Stone, Cushman Lab. Foram. Res. Contr., vol. 25, p. 52, pl. 9, fig. 14. Middle Eocene, Peru.

—— *punctato-costata* Cushman and Stone, ibid., vol. 25, p. 52, pl. 9, figs. 12, 13. Middle Eocene, Peru.

—— *pyrula* d'Orbigny, 1846, var. *pseudospinescens* Emiliani, Riv. Ital. di Pal. e Strat., vol. 55, fasc. 1, reprint p. 9, pl. 2, figs. 24, 25. Lower Pleistocene (Calabrian), Italy.

—— *rotunda* Hussey, Jour. Paleontology, vol. 23, p. 131, pl. 27, fig. 24. Middle Eocene, Louisiana.

—— *simplex* Terquem, 1882, var. *comis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 135, pl. 25, fig. 16. Eocene (Claiborne), Alabama.

Buliminella biformata Bandy, ibid., vol. 32, no. 131, p. 138, pl. 26, fig. 2. Upper Eocene, Alabama.

—— *dominicana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 185, pl. 12, fig. 12. Upper Oligocene, Dominican Republic.

—— *hanzawai* Asano, Jour. Paleontology, vol. 23, p. 428, text-fig. 1, nos. 54, 55. Miocene, Japan.

—— *longicamerata* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 138, pl. 26, fig. 8. Upper Eocene, Alabama.

CARPENTERELLA Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 313. New genus of the family Rupertiidae. Genotype: *Carpenterella truncata* Bermudez, 1949, ut infra. Middle Oligocene. (Preoccupied by Collenette, 1933, for a genus in Lepidoptera.)

—— *truncata* Bermudez, ibid., Spec. Pub. 25, p. 313, pl. 26, figs. 45–47. Middle Oligocene, Dominican Republic.

Cassidulina alabamensis Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 139, pl. 26, fig. 11. Upper Eocene, Alabama.

—— *armosa* Bandy, ibid., vol. 32, no. 131, p. 193, pl. 26, fig. 12. Upper Eocene, Alabama.

—— *diversa* Cushman and Stone, ibid., Contr. vol. 25, p. 56, pl. 10, fig. 14. Middle Eocene, Peru.

—— *dominicana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 268, pl. 20, figs. 4–6, Middle Oligocene, Dominican Republic.

—— *inconspicua* Hussey, nom. nov., in Thalmann, Cushman Lab. For. Res. Contr., vol. 25, p. 101. For: *Cassidulina parva* Hussey, 1949 ut infra.

—— *parva* Hussey, Jour. Paleontology, vol. 23, p. 140, pl. 28, figs. 4, 5. Middle Eocene, Louisiana. [NOTE: The species name is preoccupied by the variety: *Cassidulina subglobosa* Brady, 1881, var. *parva* Asano and Nakamura, 1937, Japanese Jour. Geology and Geography, vol. 14, p. 148, pl. 13, fig. 5, from the Pliocene of Japan.] Changed to: *Cassidulina inconspicua* nom. nov. Hussey ut supra.

—— *woodsi* Smith, Louisiana Geol. Surv. Bull. 26, p. 64, pl. 12, figs. 13–15. Middle Miocene, Louisiana.

Ceratobulimina hanzawai Asano, Jour. Paleontology, vol. 23, p. 428, text-fig. 1, nos. 23–27. Miocene, Japan.

—— *limbata* Hussey, ibid., vol. 23, p. 139, pl. 28, figs. 8, 9. Middle Eocene, Louisiana.

—— *rotundata* Cushman and Cederstrom, Virginia Geol. Surv. Bull. 67 (1945, published April 15, 1949), p. 36, pl. 5, fig. 7. Upper Eocene, Virginia.

—— (*Ceratocancris*) *stellata* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 85, pl. 13, fig. 6. Middle Eocene (Claiborne), Alabama.

Ceratocancris See *Ceratobulimina*.

CHAPMANININAE Frizzell, Jour. Paleontology, vol. 23, p. 482. New subfamily of family Rotaliidae. (Synonymy: Chapmaniidae Galloway, 1933, pro parte, Manual of Foraminifera, pp. 316–321). Includes the following genera: *Chapmanina* Silvestri, 1931 (middle and upper Eocene); *Ferayina* Frizzell, 1949, ut infra (middle and upper Eocene); and *Preverina* Frizzel, 1949, ut infra, (?Oligocene to middle Miocene). Middle Eocene to middle Miocene.

Chilostomella mediterranensis Cushman and Todd, Cushman Lab. Foram. Res. Contr., vol. 25, p. 92, pl. 15, figs. 25, 26. Recent, Mediterranean Sea, Straits of Sicily, 2471 meters.

—— *mexicana* Nuttall, 1928, var. *chirana* Cushman and Stone, ibid., Contr. vol. 25, p. 86, pl. 15, fig. 6. Eocene, Peru. [For: *Chilostomella mexicana* Cushman and Stone, 1947 (non Nuttall, 1928), Cushman Lab. Foram. Res. Spec. Pub. 20, p. 24, pl. 3, fig. 12].

—— *primitiva* Cushman and Todd, ibid., Contr., vol. 25, p. 85, pl. 15, fig. 1. Upper Cretaceous, Venezuela. [For: *Chilostomella* cf. *ovoidea* Reuss in: Cushman and Hedberg, 1941, Cushman Lab. Foram. Res. Contr., vol. 17, p. 98, pl. 23, fig. 16: Cushman, 1947, loc. cit., Contr., vol. 23, p. 16, pl. 4, fig. 28; and Cushman, 1946, U. S. Geol. Surv. Prof. Paper 206, p. 146, pl. 66, fig. 14.]

—— *trinitatensis* Cushman and Todd, ibid., Contr. vol. 25, p. 85, pl. 15, fig. 2. Upper Cretaceous, Trinidad, B.W.I. [For: *Chilostomella* cf. *ovoidea* Reuss in: Cushman and H. H. Renz,

1946, Cushman Lab. Foram. Res. Spec. Pub. 18, p. 47, pl. 8, fig. 8.]

Chrysalidinella papillata Bermudez, ibid., Spec. Pub. 25, p. 200, pl. 12, fig. 64. Middle Miocene, Dominican Republic.

Chrysalogonium lamellatum Bermudez, ibid., Spec. Pub. 25, p. 150, pl. 10, fig. 4. Middle Miocene, Dominican Republic.

Cibicides azuanus Bermudez, ibid., Spec. Pub. 25, p. 294, pl. 24, figs. 40–42. Middle Oligocene, Dominican Republic.

—— *barnetti* Bermudez, ibid., Spec. Pub. 25, p. 295, pl. 24, figs. 7–9. Middle Oligocene, Dominican Republic.

—— *cana* Bermudez, ibid. Spec. Pub. 25, p. 295, pl. 25, figs. 4–6. Upper Miocene, Dominican Republic.

—— *centralis* Bermudez, ibid., Spec. Pub. 25, p. 295, pl. 24, figs. 37–39. Lower Eocene, Haiti.

—— *concentricus* (Cushman, 1918) var. *washingtonensis* Cushman, R. E. Stewart and K. C. Stewart, Oregon Dept. Geol. and Min. Industr. Bull. 36, pt. 7, p. 157, pl. 18, fig. 8. Pliocene, Washington.

—— *coryelli* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 296, pl. 25, figs. 7–9. Middle Miocene, Dominican Republic. [For: *Cibicides floridanus* (Cushman) in: Coryell and Rivero, 1940, Jour. Paleontology, vol. 14, p. 334, pl. 44, fig. 10; and in: Galloway and Heminway, 1941, New York Acad. Sci., Sci. Surv. Porto Rico and Virgin Islands, vol. 3, pt. 4, p. 392, pl. 23, fig. 2.]

—— *crassidiscus* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 104, pl. 18, fig. 7. Eocene (Claiborne), Alabama. [For: *Cibicides* cf. *pseudowuellerstorfi* Cole in: Howe, 1939, Louisiana Geol. Bull. 14, p. 88, pl. 13, figs. 1–3; and for: (?)*Anomalina* sp. in Cushman and Todd, 1942, Cushman Lab. Foram. Res. Contr., vol. 18, p. 45, pl. 8, fig. 12 (non fig. 11).]

—— *discorbisiformis* Hussey, Jour. Paleontology, vol. 23, p. 142, pl. 27, figs. 22, 23. Middle Eocene, Louisiana.

—— *dohmi* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 297, pl. 24, figs. 25–27. Lower Miocene, Dominican Republic.

—— *dominicanus* Bermudez, ibid., Spec. Pub. 25, p. 298, pl. 25, figs. 25–27. Upper Oligocene, Dominican Republic.

—— *elegans* Bermudez, ibid., Spec. Pub. 25, p. 298, pl. 26, figs. 25–27. Upper Oligocene, Dominican Republic.

—— *floridanus* (Cushman, 1918) var. *diminutivus* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 104, pl. 17, fig. 4. Upper Eocene, Alabama.

—— *glabratus* Hussey, Jour. Paleontology, vol. 23, p. 142, pl. 29, figs. 10, 11. Middle Eocene, Louisiana.

—— *granulosus* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 298, pl. 24, figs. 10–12. Middle Oligocene, Dominican Republic.

—— *guraboensis* Bermudez, ibid., Spec. Pub. 25, p. 299, pl. 26, figs. 31–33. Middle Miocene, Dominican Republic.

—— *heminwayae* Bermudez, ibid., Spec. Pub. 25, p. 299, pl. 24, figs. 1–3. Middle Miocene, Dominican Republic.

—— *hispaniolae* Bermudez, ibid., Spec. Pub. 25, p. 300, pl. 25, figs. 34–36. Lower Eocene, Haiti.

—— *hunteri* Bermudez, ibid., Spec. Pub. 25, p. 300, pl. 24, figs. 31–33. Middle Oligocene, Dominican Republic.

—— *mabahethi* Said, ibid., Spec. Pub. 26, p. 42, pl. 4, fig. 20. Recent, northern Red Sea, 512 meters.

—— *mammiformis* Hussey, Jour. Paleontology, vol. 23, p. 142, pl. 29, figs. 16, 17. Middle Eocene, Louisiana.

—— *mcguirti* Hussey, ibid., vol. 23, p. 143, pl. 29, figs. 12 and 15. Middle Eocene, Louisiana.

—— *micrus* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 302, pl. 24, figs. 34–36. Lower Eocene, Haiti.

—— *mimulus* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 106, pl. 19, fig. 1. Eocene (Claiborne), Alabama.

—— *minusculus* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 303, pl. 26, figs. 28–30. Upper Miocene, Dominican Republic.

—— *pippeni* Cushman and Garrett, 1938, var. *stavensis* Bandy, Bull. Am. Paleontology, vol. 32, 3o. 131, p. 107, pl. 19, fig. 6. Eocene (Claiborne), Alabama.

—— *pseudoungerianus* (Cushman, 1922) var. *lisbonensis* Bandy, ibid., vol. 32, no. 131, p. 108, pl. 20, fig. 1. Eocene (Claiborne), Alabama.

—— *richardsoni* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 305, pl. 26, figs. 22–24. Lower Eocene, Haiti.

—— *robustus* Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 47, pl. 4, figs. 57–59. Lutetian (middle Eocene), Paris Basin, France.

—— *sculpturatus* Cushman and Cederstrom, Virginia Geol. Surv. Bull. 67 (1945, published April 15, 1949), p. 41, pl. 6, figs. 5, 6. Upper Eocene, Virginia.

—— *rhsmithi* nom nov. Hussey, in Thalmann, Cushman Lab. For. Res. Contr., vol. 25, p. 101, for *Cibicides umbilicatus* Hussey, 1949, ut infra.

—— *speciosus* Cushman and Cederstrom, Virginia Geol. Survey Bull. 67, p. 41, pl. 6, figs. 3, 4. Upper Eocene, Virginia. [NOTE: This species was pre-published by Cushman, 1948, Maryland Dept. Geol. Bull. 2, p. 244, pl. 20, fig. 13, from the Eocene of Maryland].

—— *submammiformis* Hussey, Jour. Paleontology, vol. 23, p. 143, pl. 29, figs. 20, 21. Middle Eocene, Louisiana.

—— *subtenuissimus* (Nuttall, 1928) var. *guazumalensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 306, pl. 25, figs. 43–45. Upper Oligocene, Dominican Republic.

—— *tallahattensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 110, pl. 20, fig. 5. Eocene (Claiborne), Alabama.

—— *trincherasensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 307, pl. 25, figs. 1–3. Basal upper Oligocene, Dominican Republic.

—— *truncatus* Bandy, Bull. Am. Paleontology,

vol. 32, no. 131, p. 111, pl. 19, fig. 2. Eocene (Claiborne), Alabama.

—— *umbilicatus* Hussey, Jour. Paleontology, vol. 23, p. 142, pl. 29, figs. 18, 19. Middle Eocene, Louisiana. [NOTE: This species name is preoccupied by: *Cibicides umbilicatus* Brotzen, 1948, Sveriges geol. undersčkning, (C), No. 493, Arsbok 42, no. 2, p. 84, pl. 13, fig. 6, from the Paleocene of Sweden.] Changed to: *Cibicides rhsmithi* nom. nov. Hussey, ut supra.

—— *yaguatensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 308, pl. 26, figs. 16–18. Upper Oligocene, Dominican Republic.

—— *yaquensis* Bermudez, ibid., Spec. Pub. 25, p. 309, pl. 26, figs. 1–3. Upper Miocene, Domirican Republic.

CIBICIDINA Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 91. New genus of the family Rotaliidae. Genotype: *Cibicidina walli* Bandy, 1949, ut infra. Middle and upper Eocene.

—— *mauricensis* (Howe and Roberts, 1939) var. *subinvoluta* Bandy, ibid., vol. 32, no. 131, p. 93, pl. 16, fig. 5. Eocene (Claiborne), Alabama.

—— *subminuens* Bandy, ibid., vol. 32, no. 131, p. 94, pl. 16, fig. 6. Eocene (Claiborne), Alabama.

—— *walli* Bandy, ibid., vol. 32, no. 131, p. 95, pl. 15, fig. 5. Upper Eocene (Jacksonian), Alabama.

Clavulinoides dimidiatus Bermudez, Cushman Lab. Foram. Res Spec. Pub. 25, p. 71, pl. 3, figs. 33, 34. Lower Eocene, Haiti.

—— *minimus* Boomgaart, Proefschr. (Thesis) Rijks-Univ. Utrecht, p. 57, pl. 4, fig. 7. Pliocene, eastern Java.

COMPRESSIGERINA Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 219. New genus of the family Buliminidae. Genotype: *Uvigerina coartata* D. K. Palmer, 1941, Soc. cubana hist. nat. Mem., vol. 15, p. 304, new name for *Uvigerina compressa* D. K. Palmer 1941 (non Cushman, 1925), loc. cit., vol. 15, p. 182, pl. 15, figs. 10, 11.).

Cornuspira lisbonensis Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 17, pl. 1, fig. 2. Eocene (Claiborne), Alabama.

CRIBROTURRETOIDES Smith, Louisiana Geol. Surv. Bull. 26 (July 1948, issued June 1949), p. 56. New genus of the family Valvulinidae, subfamily Eggerellinae. Genotype: *Cribroturretoides miocenica* Smith, 1949, ut infra. Middle Miocene.

—— *miocenica* Smith, ibid., Bull. 26, p. 56, pl. 12, figs 1–3. Middle Miocene, Louisiana.

Cruciloculina japonica Asano, Jour. Paleontology, vol. 23, p. 480, pl. 80, figs. 1, 2, 6–12. Pliocene, Japan.

Cuneolina dominicana Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 81. pl. 4, figs. 27–30. Upper Oligocene, Dominican Republic.

Cyclammina evolvinatus Smith, Louisiana Geol. Surv. Bull. 26 (1948, issued June 1949), p. 51, pl. 9, figs. 5, 6. Middle Miocene, Louisiana.

—— *gasparensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 53, pl. 1, figs. 47, 48. Upper Oligocene, Dominican Republic.

—— *hemiammonitiformis* Smith, Louisiana Geol. Surv. Bull. 26 (1948, issued June 1949), p. 52, pl. 9, figs. 1, 2. Middle Miocene, Louisiana.

Cyclocibicides triebeli Bartenstein, Senckenbergiana, vol. 30, p. 213, text figs. 1–4. Upper Cretaceous, northwestern Germany.

Cymbalopora tobagoensis Brönnimann, Naturf. Gesell. Basel Verh., vol. 60, p. 183, text-fig. 1. Recent, Tobago Island, B.W.I.

Darbyella miocenica Cuvillier and Szakall, Foram. d'Aquitaine, pt. 1, p. 60, pl. 23, fig. 13. Lower Miocene, France.

DAXIA Cuvillier and Szakall, ibid., pt. 1, p. 8. New genus of family Lituolidae. Genotype: *Daxia cenomana* Cuvillier and Szakall, 1949, ut infra. Basal Upper Cretaceous (Cenomanian).

—— *cenomana* Cuvillier and Szakall, ibid., pt. 1, p. 8, pl. 2, figs. 4–6. Cenomanian, France.

—— *orbignyi* Cuvillier and Szakall, ibid., pt. 1, p. 8, pl. 2, fig. 1. Cenomanian, France.

Dentalina acinacoides Hussey, Jour. Paleontology, vol. 23, p. 126, pl. 26, fig. 29. Middle Eocene, Louisiana.

—— *bevani* Cushman and Cederstrom, Virginia Geol. Surv. Bull. 67 (1948, issued April 15, 1949), p. 15, pl. 2, figs. 15–18. Upper Eocene, Virginia. [NOTE: This species was pre-published in Cushman, 1948, State of Maryland, Board Nat. Res., Dept. Geol. etc. Bull. 2, p. 229, pl. 17, figs. 5, 6, from Eocene of Maryland].

—— *cocoaensis* Cushman, 1935, var. *crucifera* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 51, pl. 7, fig. 2. Upper Eocene (Jackson), Alabama.

—— *cooperensis* Cushman, 1933, var. *nonapicalis* Bandy, ibid., vol. 32, no. 131, p. 52, pl. 7, fig. 1. Upper Eocene (Jackson), Alabama.

—— *cucumis* Loeblich and Tappan, Jour Paleontology, vol. 23, p. 257, pl. 49, fig. 7. Lower Cretaceous, Oklahoma.

—— *excentrica* Boomgaart, Proefschr. (Thesis) Rijks-Univ. Utrecht, p. 78, pl. 6, fig. 8. Pliocene, East Java.

—— *globata* Hussey, Jour. Paleontology, vol. 23, p. 126, pl. 26, fig. 24. Middle Eocene, Louisiana.

—— *paradoxa* Hussey, ibid., vol. 23, p. 126, pl. 26, fig. 23. Middle Eocene, Louisiana.

Dentostomina guraboensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 104, pl. 6, fig. 2. Middle Miocene, Dominican Republic.

Desinobulimina see *Bulimina*

Dimorphina danvillensis Howe and Wallace, 1932, var. *subtenuis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 71, pl. 10, fig. 11. Upper Eocene (Jackson), Alabama.

Discorbis alata Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 18, pl. 3, figs. 42–44. Lutetian, Paris Basin, France.

—— *alveatus* Cushman, 1933, var. *stavensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 95, pl. 16, fig. 1. Eocene (Claiborne), Alabama.

—— *baitoensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 236, pl. 15, figs. 1–3. Lower Miocene, Dominican Republic.

—— *bractifera* Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 18, pl. 3, figs. 39–41. Lutetian, Paris Basin, France.
—— *cercadensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 236, pl. 15, figs. 4–6. Lower Miocene, Dominican Republic.
—— *clara* Cushman, Inst. Roy. Sci. Nat. Belgique, Mém. 111, p. 45, pl. 8, fig. 8. Recent, off coast of Belgium, 34 meters.
—— *debilis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 237, pl. 15, figs. 13–15. Middle Oligocene, Dominican Republic.
—— *floscula* Loeblich and Tappan, Jour. Paleontology, vol. 23, p. 265, pl. 51, figs. 9–11. Lower Cretaceous, Texas. [NOTE: the spelling of the species name should be: *flosculus*.]
—— *hoffi*, Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 238, pl. 15, figs. 22–24. Upper Miocene, Dominican Republic.
—— *humilis* nom. nov. Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 24, pl. 3, figs. 48–50. Lutetian, Paris Basin. [Note: New name proposed for: "*Rosalina excavata* Terquem, 1882, pro parte"; this indication is nomenclaturally insufficient.]
—— *maoensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 239, pl. 15, figs. 25–27. Middle Miocene, Dominican Republic.
—— *parva* Hussey, Jour. Paleontology, vol. 23, p. 135, pl. 27, figs. 14, 15. Middle Eocene, Louisiana.
—— *pellucidus* Said, Cushman Lab. Foram. Res. Spec. Pub. 26, p. 35, pl. 3, fig. 33. Recent, northern Red Sea, 30–102 meters.
—— *perplexa* nom. nov. Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 21, pl 2, figs. 18–20. Lutetian, Paris Basin, France. [New name for: *Rotalina elegans* Terquem, 1882 (non d'Orbigny, 1826, *Rotalia*) Soc. géol. France, Mém. (3), vol. 2, p. 75, pl. 7, fig. 6; and for: *Rotalina marginata* Terquem, 1882, (non d'Orbigny, 1826, *Rotalia*), loc. cit., vol. 2, p. 80, pl. 8, fig. 5.]
—— *petalana* Hussey, Jour. Paleontology, vol. 23, p. 135, pl. 27, figs. 20, 21. Middle Eocene, Louisiana.
—— *suezensis* Said, Cushman Lab. Foram. Res. Spec. Pub. 26, p. 36, pl. 3, fig. 24. Recent, Gulf of Suez, northern Red Sea, 64 meters.
—— *tallahattensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 97, pl. 16, fig. 7. Eocene (Claiborne), Alabama.
—— —— —— var. *subnitens* Bandy, ibid., vol. 32, no. 131, p. 98, pl. 17, fig. 1. Eocene (Claiborne), Alabama.
—— *ubiqua* Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 23, pl. 2, figs. 27–29. Lutetian, Paris Basin, France.

DISCORBITURA Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 99. New genus of the family Rotaliidae. Genotype: *Discorbitura dignata* Bandy, 1949, ut infra. Lower Oligocene.

—— *dignata* Bandy, ibid., vol. 32, no. 131, p. 100, pl. 17, fig. 3. Lower Oligocene, Alabama.

Dorothia centralis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 83, pl. 4, figs. 37, 38. Lower Eocene, Haiti.
—— *colomi* Bermudez, ibid., Spec. Pub. 25, p. 83, pl. 4, figs. 57, 58. Middle Miocene, Dominican Republic.
—— *debilis* Bermudez, ibid., Spec. Pub. 25, p. 84, pl. 4, figs. 47, 48. Upper Oligocene, Dominican Republic.
—— *heteroclita* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 28, pl. 3, fig. 11. Upper Eocene (Jackson), Alabama.
—— *rotunda* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 60, pl. 5, fig. 4. Mio-Pliocene, East Java. (NOTE: Preoccupied by *Dorothia rotunda* (Chapman, 1902); teste Cushman, 1937 Cushman Lab. For. Res. Spec. Pub. p. 102.
—— *tenuis* Bermudez, Cushman Lab. Foram. Res., Spec. Pub. 25, p. 86, pl. 4, figs. 39, 40. Lower Eocene, Haiti.
—— *yaguatensis* Bermudez, ibid., Spec. Pub. 25, p. 86, pl. 4, figs. 55, 56. Upper Oligocene, Dominican Republic.

Dunbarinella huantensis Roberts, Upper Paleozoic of Peru, Univ. Service Bureau, Columbia Univ. New York, p. 203, pl. 38, figs. 4–6. Early Permian (Wolfcampian), Peru.
—— *mantaroensis* Roberts, ibid., p. 205, pl. 38, figs. 7, 8. Early Permian (Wolfcampian), Peru.

Dyocibicides maoensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 310, pl. 23, figs. 49–51. Middle Miocene, Dominican Republic.

Ehrenbergina amina Bermudez, ibid., Spec. Pub. 25, p. 270, pl. 20, figs. 44–46. Middle Miocene, Dominican Republic.
—— *falcata* Bermudez, ibid., Spec. Pub. 25, p. 271, pl. 20, figs. 41–43. Upper Oligocene, Dominican Republic.
—— *pineyroi* Bermudez, ibid., Spec. Pub. 25, p. 271, pl. 20, figs. 47, 48. Upper Oligocene, Dominican Republic.

Ellipsolagena alabamensis Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 147, pl. 27, fig. 16. Upper Eocene (Jacksonian) Alabama.

Elphidium asagaiense Asano, Jour. Paleontology, vol. 23, p. 476, text-fig. 2, nos. 1, 2. Upper Oligocene, Japan.
—— *cercadense* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 167, pl. 11, figs. 32, 33. Lower Miocene, Dominican Republic.
—— *delicatulum* Bermudez, ibid., Spec. Pub. 25, p. 168, pl. 11, figs. 22, 23. Upper Miocene, Dominican Republic.
—— *dominicense* Bermudez, ibid., Spec. Pub. 25, p. 169, pl. 11, figs. 38, 39. Upper Miocene, Dominican Republic.
—— *guraboense* Bermudez, ibid., Spec. Pub. 25, p. 169, pl. 11, figs. 30, 31. Middle Miocene, Dominican Republic.
—— *yumotoense* Asano, Jour. Paleontology, vol. 23, p. 476, text-fig. 1, nos. 7–9. Upper Oligocene, Japan.

Entosolenia boutoncapitata Smith, Lousiana Geol. Surv. Bull. 26, (1948, issued 1949), p. 63, pl. 12, figs. 10, 11. Middle Miocene, Louisiana.
—— *iota* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 109, pl. 11, fig. 7. Mio-Plio-

cene, East Java. (NOTE: Preoccupied by Cushman, 1923, U. S. Nat. Mus. Bull. 104, pt. 4, p. 27.)

—— *orbignyana* (Seguenza, 1862) var. *semicarinata* Boomgaart, ibid., p. 108, pl. 11, fig. 8. Miocene, East Java.

—— *submarginata* nom. nov. Boomgaart, ibid., p. 107, pl. 9, fig. 7. Mio-Pliocene, East Java. [New name for: *Lagena marginata* H. B. Brady, 1884 (non Walker and Boys, 1784), Rept. Voyage Challenger, Zool., vol. 9, p. 476, pl. 59, figs. 21, 22. For further references of synonyms see original paper.]

—— *vasiformis* Hussey, Jour. Paleontology, vol. 23, p. 133, pl. 27, fig. 9. Middle Eocene, Louisiana.

Epistomaria dominicana Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 242, pl. 16, figs. 22–24. Lower Miocene, Dominican Republic.

—— *punctata* Said, ibid., Spec. Pub. 26, p. 37, pl. 4, fig. 23. Recent, northern Red Sea, 24 meters.

—— *separans* Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 34, pl. 5, figs. 78–80. Lutetian, Paris Basin, France.

Epistomina catenula Dubourdieu and Sigal, Soc. géol. France Bull., ser 5, vol. 19, p. 219, pl. 6, fig. 5. Middle Cretaceous (Albian), Algeria.

—— *chromata* Hussey, Jour. Paleontology, vol. 23, p. 137, pl. 28, figs. 11, 12. Middle Eocene, Louisiana.

—— *colomi* Dubourdieu and Sigal, Soc. géol. France, Bull. ser 5, vol. 19, p. 217, pl. 6, fig. 4. Middle Cretaceous (Lower Albian), Algeria.

Eponidella palmerae Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 261, pl. 18, figs. 40–42. Upper Miocene, Dominican Republic.

Eponides abuillotensis Bermudez, ibid., Spec. Pub. 25, p. 244, pl. 17, figs. 4–6. Lower Eocene, Haiti.

—— *bodjonegoroensis* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 126, pl. 14, fig. 2. Miocene, East Java.

—— *conicus* Boomgaart, ibid., p. 126, pl. 12, fig. 14. Mio-Pliocene, East Java.

—— *inornata* nom. nov. Hussey, in: Thalmann, Cushm. Lab. For. Res. Contr., vol. 25, p. 101. For: *Eponides simplex* Hussey, 1949 ut infra.

—— *jaumei* Bermudez, Cushman Lab. Foram. Res., Spec. Pub. 25, p. 246, pl. 16, figs. 52–54. Upper Miocene, Dominican Republic.

—— *kirki* Bermudez, ibid., Spec. Pub. 25, p. 247, pl. 17, figs. 7–9. Lower Eocene, Haiti.

—— *lisbonensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 87, pl. 14, fig. 2. Eocene (Claiborne), Alabama.

—— *mammalonicus* Smith, Lousiana Geol. Surv. Bull. 26 (1948, issued 1949), p. 63, pl. 12, figs. 16–18. Middle Miocene, Louisiana.

—— *petricosa* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 247, pl. 17, figs. 10–12. Middle Eocene, Dominican Republic.

—— *polygonus* Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 28, pl. 5, figs. 90–92. Lutetian, Paris Basin, France.

—— *simplex* Hussey, Jour. Paleontology, vol. 23, p. 137, pl. 28, figs. 17, 18. Middle Eocene, Louisiana. [NOTE: Preoccupied by *Eponides simplex* White, 1938, *Gyroidina*) according to Cushman, 1946, U. S. Geol. Surv. Prof. Paper 206, p. 142, pl. 57, fig. 15.] Changed to: *Eponides inornata* nom. nov., Hussey, 1949, ut supra.

— *sinuosis* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 128, pl. 13, fig. 1. Pliocene, East Java.

FALSOGUTTULINA Barterstein and Brand, Jour. Paleontology, vol. 23, p. 671. New genus of the family Polymorphinidae. Genotype: *F. wolburgi* Bartenstein and Brand, 1949, ut infra. Lower Cretaceous (Valanginian).

—— *wolburgi* Bartenstein and Brand, ibid., vol. 23, p. 672, text-figs. 6–8. Lower Cretaceous (Valanginian), Germany.

FERAYINA Frizzell, ibid., vol. 23, p. 483. New genus of the family Rotaliidae, subfamily Chapmanininae. Genotype: *F. corallijormis* Frizzell, 1949, ut infra. Middle and upper Eocene.

—— *coralliformis* Frizzell, ibid., vol. 23, p. 483, text-figs. 1–4. Middle Eocene, Texas.

—— *peruviana* Frizzell, ibid., vol. 23, p. 486, text-fig. 7. Lower part upper Eocene, northwest Peru.

Fissurina crassicarinata Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 64, pl. 9, fig. 6. Upper Eocene (Jackson), Alabama.

Flabellinella lanceolata Bandy, ibid., vol. 32, no. 131, p. 44, pl. 5, fig. 16. Upper Eocene (Jackson), Alabama.

Flintina azuana Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 112, pl. 6, fig. 47. Lower Miocene, Dominican Republic.

—— *cercadensis* Bermudez, ibid., Spec. Pub. 25, p. 112, pl. 6, fig. 48. Lower Miocene, Dominican Republic.

—— *serratula* Cuvillier and Szakall, Foram. d'Aquitaine, pt. 1, p. 44, pl. 18, fig. 22. Oligocene (Stampian), France.

—— *variolaria* Cuvillier and Szakall, ibid., pt. 1, p. 44, pl. 18, fig. 20. Oligocene (Stampian), France.

Flosculinella reicheli Mohler, Eclogae geol. Helvetiae, vol. 42, no. 2, 1949 (published summer 1950), p. 522, text-fig. 2 (holotype). Miocene (lower Burdigalian), South Borneo.

Frondicularia capitana Cushman and Stone, Cushman Lab. Foram. Res. Contr., vol. 25, p. 51, pl. 9, figs. 9–11. Middle Eocene, Peru.

—— *elegantissima* Hussey, Jour. Paleontology, vol. 23, p. 125, pl. 26, fig. 27. Middle Eocene, Louisiana.

—— *hunteri* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 158, pl. 10. figs. 29–31. Upper Oligocene, Dominican Republic.

—— *moscosoi* Bermudez, ibid., Spec. Pub. 25, p. 159, pl. 10, figs. 36, 37. Upper Oligocene, Dominican Republic.

—— *olssoni* Bermudez, ibid., Spec. Pub. 25, p. 159, pl. 10, figs. 26–28. Middle Oligocene, Dominican Republic.

—— *virginiana* Cushman and Cederstrom, Vir-

ginia Geol. Surv. Bull. 67 (1948, issued 1949), p. 17, pl. 3, figs. 6–9. Upper Eocene, Virginia.

—— *yaguatensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 160, pl. 10, figs. 23–25. Middle Oligocene, Dominican Republic.

—— *yaquensis* Bermudez, ibid., Spec. Pub. 25, p. 160, pl. 10, fig. 32. Upper Miocene, Dominican Republic.

Gaudryina atuillotensis Bermudez, ibid., Spec. Pub. 25, p. 73, pl. 3, figs. 55, 56. Lower Eocene, Haiti.

—— *althi* Cushman and Glazewski, ibid., Contr. vol. 25, p. 7, pl. 2, fig. 7. Upper Jurassic, Poland.

—— *bukowiensis* Cushman and Glazewski, ibid., Contr. vol. 25, p. 8, pl. 2, figs. 10, 11. Upper Jurassic, Poland.

—— *fortiuscula* Bermudez, ibid., Spec. Pub. 25, p. 74, pl. 3, figs. 57, 58. Middle Oligocene, Dominican Republic.

—— *haitiensis* Bermudez, ibid., Spec. Pub. 25, p. 75, pl. 3, figs. 49, 50. Lower Eocene, Haiti.

—— *jurassica* Cushman and Glazewski, ibid., Contr., vol. 25, p. 8, pl. 2, figs. 8, 9. Upper Jurassic, Poland.

—— *longa* Bermudez, ibid., Spec. Pub. 25, p. 76, pl. 3, figs. 71, 72. Middle Oligocene, Dominican Republic.

—— *modica* Bermudez, ibid., Spec. Pub. 25, p. 76, pl. 3, figs. 53, 54. Lower Eocene, Haiti.

—— *pliocenica* Cushman, R. E. Stewart and K. C. Stewart, Oregon Dept. Geol. and Min. Ind. Bull. 36, pt. 7, p. 150, pl. 17, fig. 2. Pliocene, Washington.

—— *stavensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 29, p. 3, fig. 8. Lower Oligocene, Alabama.

—— *vadaszi* Cushman and Glazewski, Cushman Lab. Foram. Res. Contr., vol. 25, p. 7, pl. 2, figs. 5, 6. Upper Jurassic, Poland. [For: *Gaudryina textilaroides* Vadasz, 1911 (non Hantken 1876), Res. Wissensch. Erforschung Balaton-See, vol. I, pt. 1, Anhang Palaeont., vol. I, no. 1, p. 15, pl. 1, fig. 6.]

Glandulina simplex Hussey, Jour. Paleontology, vol. 23, p. 130, pl. 26, fig. 22. Middle Eocene, Louisiana.

Globigerina increbescens Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 120, pl. 23, fig. 3. Upper Eocene (Jackson), Alabama.

—— *ouachitaensis* Howe and Wallace, 1932, var. *senilis* Bandy, ibid., vol. 32, no. 131, p. 121, pl. 22, fig. 5. Upper Eocene (Jackson), Alabama. [For: *(?)Globigerina conlgomerata* Galloway and Morrey, 1929 (non Schwager, 1866)., Bull. Am. Paleontology, vol. 15, no. 55, p. 9, pl. 3, fig. 7].

—— *pseudodubia* Bandy, ibid., vol. 32, no. 131, p. 123, pl. 24, fig. 1. Middle Eocene (Claiborne), Alabama.

—— *pseudovoluta* Bandy, ibid., vol. 32, no. 131, p. 123, pl. 24, fig. 4. Middle Eocene (Claiborne), Alabama.

—— *rotundata* d'Orbigny, 1826, var. *jacksonensis* Bandy, ibid., vol. 32, no. 131, p. 121, pl. 23, fig. 6. Upper Eocene (Jackson), Alabama.

—— *spinuloinflata* Bandy, ibid., vol. 32, no. 131, p. 122, pl. 23, fig. 1. Middle Eocene, Alabama.

Globoquadrina quadraria (Cushman and Ellisor, 1939) var. *advena* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 287, pl. 22, figs. 36–38. Middle Miocene, Dominican Republic.

Globorotalia albeari Cushman and Bermudez, ibid., Contr. vol. 25, p. 33, pl. 6, figs. 13–15. Paleocene, Cuba.

—— *capdevilensis* Cushman and Bermudez, ibid., Contr. vol. 25, p. 32, pl. 6, figs. 10–12. Lower Eocene, Cuba.

—— *cibaoensis* Bermudez, ibid., Spec. Pub. 25, p. 285, pl. 22, figs. 21–23. Upper Miocene, Dominican Republic.

—— *inflata* Hussey, Jour. Paleontology, vol. 23, p. 141, pl. 29, figs. 4, 5. Middle Eocene, Louisiana.

—— *lobata* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 286, pl. 22, figs. 15–17. Upper Oligocene, Dominican Republic. [Preoccupied by: Brotzen, 1948, Sveriges geol. undersöckning (C), no. 493, Arsbok 42, No. 2, p. 91, pl. 17, fig. 3.]

—— *perforataminuta* Hussey, Jour. Paleontology, vol. 23, p. 141, pl. 22, figs. 6, 7. Middle Eocene, Louisiana.

Globorotalia (*Truncorotalia*) *brödermanni* Cushman and Bermudez, Cushman Lab. Foram. Res. Contr., vol. 25, p. 40, pl. 7, figs. 22–24. Lower Eocene, Cuba.

—— (*Turborotalia*) *oceanica* Cushman and Bermudez, ibid., Contr. vol. 25, p. 43, pl. 8, figs. 13–15. Recent, off north coast of Cuba, 250 fathoms. [For: *Pulvinulina crassa* H. B. Brady, 1884 (non d'Orbigny, 1850, *Rotalina*) Rept. Voyage Challenger, Zool., vol. 9, p. 694, pl. 103, figs. 11, 12. [NOTE: Brady's species has been assigned to *Globorotalia crassula* (Cushman and Stewart, 1930.]

Globotruncana (*Rotalipora*) *imbricata* Mornod, Eclogae geol. Helvetiae, vol. 42, no. 2, 1949 (published summer 1950), p. 589, text-figs. 5, IIa–c; IIIa–d (holotype), pl. 15, figs. 21–24. Upper Cretaceous (Turonian), Swiss Prealpes.

—— (——) *montsalvensis* Mornod, ibid., vol. 42, no. 2, p. 584, text-figs. 4, Ia–c (holotype), 7, 1a–c; 2a–c. Upper Cretaceous (Cenomanian), Swiss Prealpes.

—— —— —— var. *minor* Mornod, ibid., vol. 42, no. 2, p. 586, text-fig. 4, IIa–c (holotype), 8, nos. 1a–c; 2–4. Upper Cretaceous (Cenomanian), Swiss Prealpes.

—— (——) *reicheli* Mornod, ibid., vol. 42, no. 2, p. 583, text-fig. 5, IVa–c (holotype), 6, nos. 1–6; pl. 15, figs. 2a–p. Upper Cretaceous (Cenomanian), Swiss Prealpes.

—— (*Globotruncana*) *sigali* Reichel, ibid., vol. 42, no. 2, p. 610, text-fig. 5(holotype); pl. 16, fig. 7; pl. 17, fig. 7. Upper Cretaceous (Lower Turnonian), Algeria.

—— (——) *stephani* Gandolfi, 1942, var. *turbinata* Reichel, ibid., vol. 42, no. 2, p. 609. (For: *Globotruncana apenninica* Renz, 1936, var. *beta* Gandolfi, 1942, Riv, Italiana Paleontologia, vol. 48, Mem. 4, p. 118, text-fig. 41-b.) Upper Cretaceous (Cenomanian), southern Switzerland.

Goësella guraboensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 88, pl. 5, figs. 1–4. Middle Miocene, Dominican Republic.

—— *trincherasensis* Bermudez, ibid., Spec. Pub. 25, p. 89, pl. 5, figs. 5–8. Upper Oligocene, Dominican Republic.

Gonatosphaera inflata Bermudez, ibid., Spec. Pub. 25, p. 232, pl. 14, figs. 50, 51. Upper Oligocene, Dominican Republic.

Gümbelina multicellaris Hussey, Jour. Paleontology, vol. 23, p. 130, pl. 27, fig. 10, Middle Eocene, Louisiana.

Gümbelitria stavensis Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 124, pl. 24, fig. 5. Middle Eocene, Alabama.

Guttulina magna Hussey, Jour. Paleontology, vol. 23, p. 129, pl. 26, fig. 28. Middle Eocene, Louisiana.

—— *obscura* Hussey, ibid., vol. 23, p. 129, pl. 26, fig. 19. Middle Eocene, Louisiana.

—— *stavensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 69, pl. 10, fig. 8. Middle Eocene (Claibornian), Alabama.

—— *symploca* Loeblich and Tappan, Jour. Paleontology, vol. 23, p. 260, pl. 50, figs. 1, 2. Lower Cretaceous, Oklahoma.

Gyroidina basicrassata Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 252, pl. 17, figs. 49–51. Middle Miocene, Dominican Republic.

—— *cibaoensis* Bermudez, ibid., Spec. Pub. 25, p. 252, pl. 17, figs. 61–63. Upper Miocene, Dominican Republic. (For: *Gyroidina laevis* d'Orbigny in Coryell and Rivero, 1940, Jour. Paleontology, vol. 14, p. 336, pl. 43, figs. 20, 28. Middle Miocene, Haiti).

—— *cushmani* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 124, pl. 9, fig. 9. Mio-Pliocene, East Java.

—— *limbata* Hussey, Jour. Paleontology, vol. 23, p. 136, pl. 28, figs. 6, 7. Middle Eocene, Louisiana.

—— *mauryae* Bermudez, Cushman Lab. Foram. Res. Spec. Publ. 25, p. 253, pl. 17, figs. 43–45. Upper Oligocene, Dominican Republic.

—— —— —— var. *cristobalensis* Bermudez, ibid., Spec. Pub. 25, p. 253, pl. 17, figs. 46–48. Middle Oligocene, Dominican Republic.

—— *neosoldanii* Brotzen, 1936, var. *acuta* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 125, pl. 14, fig. 1. Pliocene, East Java.

—— —— —— var. *pequena* Boomgaart, ibid., p. 125, pl. 12, fig. 13. Miocene, East Java.

—— *obesa* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 90, pl. 14, fig. 4. Upper Eocene (Jackson), Alabama.

—— *pudica* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 254, pl. 17, figs. 67–69 Lower Eocene, Haiti.

—— *scita* Cushman and Stone, ibid., Contr., vol. 25, p. 56, pl. 10, fig. 12. Middle Eocene, Peru.

—— *trincherasensis* Bermudez, ibid., Spec. Pub. 25, p. 254, pl. 17, figs. 55–57. Upper Oligocene, Dominican Republic.

GYROIDINELLA Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 27, New genus of the family Rotaliidae, Genotype: *G. magna* Y. LeCalvez, ut infra. Lutetian.

—— *magna* Y. LeCalvez, ibid., p. 27, pl. 6, figs. 103–105. Lutetian, Paris Basin, France.

Hagenowella paleocenica Hofker, Jour. Paleontology, vol. 23, p. 434, text-figs. 1–3. Paleocene, Netherlands.

Hanzawaia tagaensis Asano, ibid., vol. 23, p. 430, text-fig. 2, nos. 28–32. Miocene, Japan.

Haplophragmoides albus Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 45, pl. 1, fig. 7. Pliocene, East Java.

—— *bulloides* Boomgaart, ibid., p. 45, pl. 1, fig. 8. Pliocene, East Java.

—— *canariensis* (d'Orbigny, 1839) var. *acutus* Boomgart, ibid., p. 46, pl. 1, fig. 9. Mio-Pliocene, Java.

—— *complanata* Hussey, Jour. Paleontology, vol. 23, p. 118, pl. 26, fig. 1. Middle Eocene, Louisiana.

—— *giganteus* Boomgaart, Proefschr. (Thesis) Rijks-Univ. Utrecht, p. 46, pl. 2, fig. 1. Miocene, East Java.

—— *houghi* Smith, Louisiana Geol. Surv. Bull. 26 (1948, issued 1949), p. 47, pl. 10, fig. 6. Middle Miocene, Louisiana.

—— *inornatus* Boomgaart, Proefschr. (Thesis) Rijks-Univ. Utrecht, p. 47, pl. 2, fig. 3. Mio-Pliocene, East Java.

—— *proboscidiformis* Smith, Louisiana Geol. Surv. Bull. 26 (1948, published 1949), p. 48. pl. 9, figs. 9, 10. Middle Miocene, Louisiana.

—— *pseudolatidorsatum* Smith, ibid., Bull. 26, p. 48, pl. 10, figs. 7, 8 (not pl. 9, fig. 7, 8). Middle Miocene, Louisiana.

—— *reticulatus* Boomgaart, Proefschr. (Thesis) Rijks-Univ. Utrecht, p. 47, pl. 2, fig. 4. Miocene, East Java.

—— *tallahattensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 26, pl. 3, fig. 3. Middle Eocene (Claiborne), Alabama.

—— *wilsoni* Smith, Louisiana Geol. Surv. Bull. 26 (1948, published 1949), p. 49, pl. 9, figs. 11, 12. Middle Miocene, Louisiana.

Haplostiche trigona Hofker, Inst. Roy. Sci. Nat. Belgique, Mem. 112, p. 8, text-fig. 4. Upper Cretaceous (Maestrichtian), Netherlands.

HECHTINA Bartenstein and Brand, Jour. Paleontology, vol. 23, p. 669. New genus of the family Miliolidae, subfamily Hauerininae. [For: *Hauerina* Reuss, 1863 (non d'Orbigny, 1839). Genotype: *Hechtina praeantiqua* Bartenstein and Brand, ut infra.] Lower Cretaceous (middle Valanginian to lower Barremian.

—— *praeantiqua* Bartenstein and Brand, ibid., vol. 23, p. 669, text-figs. 1, 2. Lower Cretaceous, northwestern Germany.

HELLENOCYCLINA Reichel, Eclogae geol. Helvetiae, vol. 42, no. 2, 1949 (published summer 1950), p. 482. New genus of the family Orbitoididae. Genotype: *H. beotica* Reichel, 1949, ut infra. Upper Cretaceous (Maestrichtian).

—— *beotica* Reichel, ibid., vol. 42, no. 2, p. 482, text-figs. 1–10 (holotype: text-fig. 2). Upper Cretaceous (Maestrichtian), Greece.

HISTOPOMPHUS Loeblich and Tappan, Jour. Paleontology, vol. 23, p. 262. New genus of the family Polymorphinidae, subfamily Ramulininae. Genotype: *Globulina redriverensis* Tappan, 1943, Jour. Paleontology, vol. 17, p. 505, pl. 81, figs. 1–3. Lower Cretaceous.

Karreriella proxima Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 91, pl. 5, figs. 27, 28. Upper Miocene, Dominican Republic,

—— —— —— var. *palmaritoensis* Bermudez. ibid., Spec. Pub. 25, p. 91, pl. 5, figs. 29, 30. Upper Oligocene, Dominican Republic.

—— *subcylindrica* (Nuttall, 1928), var. *nana* Bermudez, ibid., Spec. Pub. 25, p. 91, pl. 5, figs. 25, 26. Upper Oligocene, Dominican Republic.

Kelyphistoma siphoninaeformis Sigal, Revue Inst. Franç. Pétrole et Ann. Combust. Liquides, vol. 4, p. 157, pl. 1, fig. 1; pl. 3, fig. 1 (holotype); paratypes: pl. I, figs. 2, 3; pl. 3, fig. 6. Aquitanian, France.

Lagena abnormacostata Smith, Louisiana Geol. Surv. Bull. 26, 1948 (issued 1949), p. 61, pl. 12, figs. 8, 9. Middle Miocene, Louisiana.

—— *dominicana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 116, pl. 11, figs. 2, 3. Middle Oligocene, Dominican Republic.

—— *elliptica* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 5, pl. 7, fig. 16. Middle Eocene (Claiborne), Alabama. (Preoccupied by: Reuss, 1863, K. Akad. Sitzungsber. Wiss. Math-nat. Kl., vol. 46, Abt. 1, p. 35, pl. 2, fig. 2; and by: Cushman, 1923, U. S. Nat. Mus. Bull. 104, pt. 4, p. 42, pl. 6, figs. 10–12.) (NOTE: Changed to *Lagena parvulipora* nom. nov., Bandy, 1949, ut infra.)

—— *horquetensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 117, pl. 10, fig. 51. Middle Oligocene, Dominican Republic.

—— *humerifera* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 56, pl. 7, fig. 17. Lower Oligocene, Alabama.

—— *laevis* (Montagu, 1803), var. *circumaciculata* Smith, Louisiana Geol. Surv. Bull. 26 (1948, issued 1949), p. 62, pl. 11, fig. 12. Middle Miocene, Louisiana.

—— —— —— var. *stavensis* Bandy, Bull Am. Paleontology, vol. 32, no. 131, p. 56, pl. 7, fig. 15. Upper Eocene (Jackson), Alabama. [For: *Lagena laevis* var. Bergquist, 1942 (non Montagu, 1803), Miss. Geol. Survey Bull. 49, p. 51, pl. 5, fig. 7, from Upper Eocene of Mississippi.]

—— *ouachitaensis* Howe and Wallace, 1932, var. *alabamensis* Bandy, ibid., vol. 32, no. 131, p. 57, pl. 7, fig. 12. Eocene (Claiborne), Alabama.

—— *parvulipora* nom. nov., Bandy, Jour. Paleontology, vol. 23, p. 440. New name for *Lagena elliptica* Bandy, 1949 ut supra.

—— *sulcata* (Walker and Jacob, 1798) var. *spirata* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 57, pl. 7, fig. 18. Eocene (Claiborne), Alabama. [For: *Lagena sulcata* Brady, 1884 (non Walker and Jacob, 1798), Rept. Voyage Challenger, Zool., vol. 9, pl. 57, fig. 23 only; and for same species in Cushman, 1923, U. S. Nat. Mus. Bull. 104, pt. 4, p. 57, pl. 2, fig. 1.]

—— *vulgaris* Williamson, 1858, var. *basispinata* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 90, pl. 8, fig. 2. Pliocene, East Java. [For: *Lagena vulgaris* Williamson, 1858, Rec. Foram. Gt. Britain, p. 4, pl. 1, fig. 5; and for: *Lagena laevis* Brady, 1884 (non Montagu, 1803), Rept. Voyage Challenger, Zool., vol. 9, p. 455, pl. 56, figs. 7–14, 30.]

—— *wallacei* Bandy, Bull. Amer. Paleontology, vol. 32, no. 131, p. 57, pl. 7, fig. 19. Lower Oligocene, Alabama. (For: *Lagena* sp. B in Howe and Wallace, Louisiana Geol. Bull. 2, p. 30, pl. 6, fig. 10; and in Bergquist, 1942, Miss. Geol. Bull. 49, p. 53, pl. 5, fig. 26.)

Lagenammina tortuotrigonalis Smith, Louisiana Geol. Surv. Bull. 26 (1948, issued 1949), p. 41, pl. 12, fig. 4. Middle Miocene, Louisiana.

Lagenonodosaria fukushimaensis Asano, Jour. Paleontology, vol. 23, p. 426, text-fig. 1, no. 4; text-fig. 2, nos. 20, 21. Miocene, Japan.

Lamarckina biconvexa Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 82, pl. 12, fig. 3. Eocene (Claiborne), Alabama.

—— *claibornensis* Cushman, 1926, var. *gemmulata* Hussey, Jour. Paleontology, vol. 23, p. 136, pl. 28, fig. 10. Middle Eocene, Louisiana.

—— *guraboensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 241, pl. 16, figs. 16–18. Middle Miocene, Dominican Republic.

—— *ovula* Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 26, pl. 5, figs. 84–86. Lutetian, Paris Basin, France.

Lenticulina cibaoensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 133, pl. 8, figs. 33, 34. Middle Miocene, Dominican Republic. [For: *Hemicristellaria fragaria* (Gümbel) in: Galloway and Heminway, 1941, New York Acad. Sci., Sci. Surv. Porto Rico and Virgin Islands, vol. 3, pt. 4, p. 335, pl. 9, fig. 7.]

—— *cristobalensis* Bermudez, ibid., Spec. Pub. 25, p. 133, pl. 8, figs. 29, 30. Middle Oligocene, Dominican Republic.

—— *fukushimaensis* Asano, Jour. Paleontology, vol. 23, p. 476, text-fig. 2, no. 3. Upper Oligocene, Japan.

—— *guraboensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 134, pl. 8, figs. 25, 26. Middle Miocene, Dominican Republic.

—— *yaguatensis* Bermudez, ibid., Spec. Pub. 25, p. 135, pl. 8, figs. 23, 24. Middle Oligocene, Dominican Republic.

Lepidocyclina (*Nephrolepidina*) *makiyamai* Morishima, Jour. Paleontology, vol. 23, p. 212, pl. 44, figs. 1–4; pl. 45, figs. 1–4. Miocene (Vindobonian), Japan.

—— (*Lepidocyclina*) *montgomeriensis* nom. nov. Cole, ibid., vol. 23, p. 270, pl. 53, figs. 2–11; pl. 54, fig. 8. Upper Eocene, Panama Canal Zone. New name for: *Lepidocyclina mortoni* Cushman, 1920 (non Prever, 1912), U. S. Geol. Surv. Prof. Paper 125, p. 70, pl. 27, figs. 1–4; pl. 28, figs. 12; for same species in

Gravell and Hanna, 1935, Jour. Paleontology, vol. 9, p. 337, pl. 30, figs. 1–9; pl. 31, figs. 1–11; pl. 32, figs. 1–4; and for same species in Cole, 1945, Florida Geol. Survey Bull. 28, p. 120, pl. 20, figs. 1–12.

—— (*Multilepidina*) *wanneri* Van den Abeele, K. Akad. Wetensch. Amsterdam Proc., vol. 52, p. 764, pl. 1, figs. a–d. Miocene, Java.

Liebusella baitoensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 96, pl. 5, figs. 71–74. Middle Miocene, Dominican Republic.

Lingulina seminuda Reuss, var. *denudata* Smith, Louisiana Geol. Surv. Bull. 26 (1948, issued 1949), p. 61, pl. 9, figs. 13–15. Middle Miocene, Louisiana. (NOTE: The author of the species name is Hantken, 1876, not Reuss.]

Lingulina subcrassa Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 64, pl. 9, fig. 5, Upper Eocene (Jackson), Alabama.

Listerella minuta Hussey, Jour. Paleontology, vol. 23, p. 119, pl. 26, fig. 2. Middle Eocene, Louisiana. (NOTE: should be assigned to the genus *Schenckiella*.)

Lituola compressa Cushman and Glazewski, Cushman Lab. Foram. Res. Contr., vol. 25, p. 5, pl. 1, figs. 8–10. Upper Jurassic, Poland.

—— *podolica* Cushman and Glazewski, ibid., Contr., vol. 25, p. 4, pl. 1, figs. 4, 5. Upper Jurassic (Portlandian), Poland.

—— *siemiradzkii* Cushman and Glazewski, ibid., Contr., vol. 25, p. 5, pl. 1, figs. 6, 7. Upper Jurassic, Poland.

Loxostomum baculum Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 131, pl. 25, fig. 8. Upper Eocene (Jackson), Alabama.

—— *cibaoensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 196, pl. 12, fig. 53. Middle Miocene, Dominican Republic.

—— *karrerianum* (Brady, 1881) var. *javanense* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 113, pl. 12, fig. 5. Miocene, Java. [NOTE: Genus name wrongly spelled *Loxostoma*].

—— *limbatum* (Brady, 1881), var. *robustum* Said, Cushman Lab. Foram. Res. Spec. Pub. 26, p. 29, pl. 3, fig. 20. Recent, northern Red Sea, 30–102 meters.

—— *longiforme* Cushman and Cederstrom, Virginia Geol. Surv. Bull. 57 (1945, issued April 15, 1949), p. 29, pl. 4, fig. 13. Upper Eocene, Virginia. [NOTE: This species was pre-published by Cushman, 1948, State of Maryland, Board of Nat. Res., Dept. Geol., etc., Bull. 2, p. 236, pl. 19, fig. 2 from the Eocene of Maryland.)

—— *serrula* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 131, pl. 25, fig. 11. Eocene (Claibornian), Alabama.

Marginulina abuillotensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 139, pl. 9, figs. 17, 18. Lower Eocene, Haiti.

—— *africana* Muraour, Bull. Serv. Carte géol. Algérie (1), Paléont. no. 10, p. 109, pl. 2, figs. 22, 23. Lower Pliocene, Algeria.

—— *anconoides* Hussey, Jour. Paleontology, vol. 23, p. 122, pl. 25, fig. 3. Middle Eocene, Louisiana.

—— *bulbosa* Hussey, ibid., vol. 23, p. 124, pl. 26, figs. 7, 8. Middle Eocene, Louisiana.

—— *crepiduliformis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 139, pl. 9, figs. 24, 25. Upper Oligocene, Dominican Republic.

—— *crossota* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 45, pl. 6, fig. 3. Upper Eocene (Jackson), Alabama.

—— *darbyella* Hussey, Jour. Paleontology, vol. 23, p. 122, pl. 25, fig. 4. Middle Eocene, Louisiana.

—— *digitalis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 46, pl. 6, fig. 6. Upper Eocene (Jackson) Alabama.

—— *dominicana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 140, pl. 9, fig. 26. Middle Oligocene, Dominican Republic.

—— *hantkeni* nom. nov. Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 46, pl. 6, fig. 9. Upper Eocene (Jackson), Alabama. New name for: *Marginulina subbullata* Hantken, 1875, Magy. kir. földt. int. evkön., vol. 4, p. 39, pl. 4, figs. 9, 10 (non Gümbel, 1861); and for same species in Bergquist, 1942, Mississippi Geol. Survey Bull. 49, p. 38, pl. 4, figs. 4–6.

—— *hispaniolana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 140, pl. 9, figs. 32, 33. Middle Miocene, Dominican Republic.

—— *inconspicua* Hussey, Jour. Paleontology, vol. 23, p. 123, pl. 26, fig. 10. Middle Eocene, Louisiana.

—— *inornata* Hussey, ibid., vol. 23, p. 123, pl. 26, figs. 11, 12. Middle Eocene, Louisiana.

—— *insignifica* Hussey, ibid., vol. 23, p. 122, pl. 25, fig. 7. Middle Eocene, Louisiana.

—— *longicollis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 140, pl. 9, figs. 13, 14. Upper Oligocene, Dominican Republic.

—— *nonconforma* Hussey, Jour. Paleontology, vol. 23, p. 122, pl. 26, fig. 9. Middle Eocene, Louisiana.

—— *producta* Hussey, ibid., vol. 23, p. 123, pl. 25, fig. 9. Middle Eocene, Louisiana.

—— *stavensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 48, pl. 6, fig. 8. Upper Eocene (Jackson), Alabama.

—— *striatoglabrata* Hussey, Jour. Paleontology, vol. 23, p. 123, pl. 25, fig. 5. Middle Eocene, Louisiana. (NOTE: Genus name is misspelled *Margulina*.)

—— *subglobosa* Hussey, ibid., vol. 23, p. 123, pl. 26, fig. 16. Middle Eocene, Louisiana.

—— *tenuistriata* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 142, pl. 9, figs. 34–37. Middle Miocene, Dominican Republic.

—— *yaguatensis* Bermudez, ibid., vol. 23, p. 142, pl. 9, fig. 29. Upper Oligocene, Dominican Republic.

Massilina misrensis Said, ibid., Spec. Pub. 26, p. 11, pl. 1, fig. 32. Recent, northern Red Sea, 17–21 meters.

—— *tenuissima* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 104, pl. 6, fig. 19. Middle Miocene, Dominican Republic.

—— *yazooensis* Bandy, Bull. Am. Paleontology,

vol. 32, no. 131, p. 25, pl. 3, fig. 2. Upper Eocene (Jackson), Alabama.

Matanzia cibaoensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 87, pl. 4, figs. 65, 66. Upper Miocene, Dominican Republic.

—— *incrassata* Bermudez, ibid., Spec. Pub. 25, p. 87, pl. 4, figs. 69, 70. Upper Miocene, Dominican Republic.

—— *proxima* Bermudez, ibid., Spec. Pub. 25, p. 87, pl. 4, figs. 67, 68. Middle Oligocene, Dominican Republic.

Multilepidina. See *Lepidocyclina*.

NEOFLABELLINA nom. nov., Bartenstein, (see under Nomenclatural Remarks).

NEOGYROIDINA Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 255. New genus of the family Rotaliidae. Genotype: *Gyroidina protea* Cushman and Bermudez, 1937, Cushman Lab. Foram. Res. Contr., vol. 13, p. 22, pl. 2, figs. 39–41. Middle and upper Eocene.

Nephrolepidina. See *Lepidocyclina*.

Nodobaculariella turbiformis Cuvillier and Szakall, Foram. d'Aquitaine, pt. 1, p. 48, pl. 20, fig. 7. Oligocene (Stampian) France.

Nodogenerina aminaensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 178, pl. 11, fig. 57. Middle Miocene, Dominican Republic.

—— *aperturata* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 98, pl. 8, figs. 7–11. Mio-Pliocene, Java.

—— *heterosculpta* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 178, pl. 11, fig. 58. Oligocene, Dominican Republic.

—— *javana* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 103, pl. 8, fig. 22. Pliocene, Java.

—— *laevigata* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 179, pl. 11, fig. 59. Upper Oligocene, Dominican Republic.

—— *pacifica* nom. nov., Boomgart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 99, pl. 8, fig. 15. Pliocene, Java. New name for: *Nodosaria insecta* Schwager in: Cushman, 1921, U. S. Nat. Mus. Bull. 100, vol. 4, p. 189, pl. 24, fig. 3; LeRoy, 1941, Colorado School of Mines Quart., vol. 36, pt. 2, pl. 2, fig. 36; and LeRoy, 1944, loc. cit., pl. 1, fig. 18.

—— *scalaris* (Batsch, 1791) var. *quadrata* Boomgaart, ibid., p. 102, pl. 8, fig. 18. Pliocene, Java.

—— —— (——) var. *simplex* Boomgaart, ibid., p. 102, pl. 8, fig. 20. Pliocene, Java.

—— —— (——) var. *spinifera* Boomgaart, ibid., p. 102, pl. 8, fig. 21. Pliocene, Java.

—— *trincherasensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 179, pl. 11, fig. 60. Upper Oligocene, Dominican Republic.

Nodosarella annulospinosa Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 146, pl. 27, fig. 14. Upper Eocene (Jackson), Alabama.

—— *elongata* Hussey, Jour. Paleontology, vol. 23, p. 135, pl. 27, figs. 4, 5. Middle Eocene, Louisiana.

—— *hologlypta* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 231, pl. 14, fig. 31. Middle Oligocene, Dominican Republic.

Nodosaria bradyi nom. nov., Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 79, pl. 6, fig. 11. Pliocene, Java. New name for: *Nodosaria raphanus* Brady, 1884 (non Linné, 1758), Rept. Challenger, Zool., vol. 9, p. 512, pl. 64, figs. 6–10. [NOTE: Preoccupied by *Nodosaria* (*Dentalina*) *bradyi* Spandel, 1901 Festschr. Saecular-Feier Naturf. Ges. Nürnberg, p. 179, text-fig. 9 from the Permo-Carboniferous of Kansas.]

—— *delicata* Hussey, Jour. Paleontology, vol. 23, p. 127, pl. 26, fig. 21. Middle Eocene, Louisiana.

—— *ithystoecha* Loeblich and Tappan, ibid., vol. 23, p. 258, pl. 49, figs. 17, 18. Lower Cretaceous, Texas.

—— *kokozuraensis* Asano, ibid., vol. 23, p. 426, text-fig. 1, no. 2, Miocene, Japan.

—— *maoensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 145, pl. 9, fig. 53. Middle Miocene, Dominican Republic.

—— *pyriformis* Hussey, Jour. Paleontology, vol. 23, p. 127, pl. 26, fig. 25. Middle Eocene, Louisiana. [Preoccupied by *Dentalina* (*Nodosaria*) *pyriformis* Terquem, 1858, Acad. Imp. Metz Mém., vol. 39, p. 608, pl. 2, fig. 22. Changed to: *Nodosaria tryloniformis* Hussey, ut infra.]

—— *rigentia* Loeblich and Tappan, ibid., vol. 23, p. 258, pl. 49, fig. 16. Lower Cretaceous, Oklahoma.

—— *selenoides* Hussey, ibid., vol. 23, p. 127, pl. 26, fig. 30. Middle Eocene, Louisiana.

—— *simplex* Silvestri, 1872, var. *gracibasica* Smith, Louisiana Geol. Surv. Bull. 26, (1948, issued 1949), p. 60, pl. 11, fig. 13. Middle Miocene, Louisiana.

—— *tryloniformis* nom. nov. Hussey, in Thalmann, Cushman Lab. For. Res. Contr., vol. 25, p. 102. For: *Nodosaria pyriformis* Hussey, 1949 ut supra.

Nonion nakosoense Asano, Jour. Paleontology, vol. 23, p. 428, text-fig. 2, nos. 14–17. Miocene, Japan.

—— *rolshauseni* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 74, pl. 11, fig. 3. Eocene (Claiborne), Alabama.

—— *stavensis* Bandy, ibid., vol. 32, no. 131, p. 75, pl. 11, fig. 5. Eocene (Claiborne), Alabama.

—— *tallahattensis* Bandy, ibid., vol. 32, no. 131, p. 75, pl. 11, fig. 11. Eocene (Claiborne), Alabama.

Nonionella jacksonensis Cushman, 1933, var. *spiralis* Bandy, ibid., vol. 32, no. 131, p. 77, p. 11, fig. 7. Eocene (Claiborne), Alabama.

—— *longicamerata* Bandy, ibid., vol. 32, no. 131, p. 77, pl. 11, fig. 8. Eocene (Claiborne), Alabama.

—— *mariannae* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 93, pl. 11, fig. 2. Pliocene, Java.

OLSSONINA Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 99. New genus of the family Valvulinidae. Genotype: *Olssonina cribrosa* Bermudez, 1949, ut infra. Middle Eocene.

—— *cribrosa* Bermudez, ibid., Spec. Pub. 25,

p. 100, pl. 5, figs. 81–83. Middle Eocene, Dominican Republic.

Paleopolymorphina eocaenica Hussey, Jour. Paleontology, vol. 23, p. 128, pl. 26, fig. 20. Middle Eocene, Louisiana.

Palmula borroi Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 156, pl. 10, fig. 19, Middle Miocene, Dominican Republic.

—— —— —— var. *tenuistriata* Bermudez, ibid., Spec. Pub. 25, p. 157, pl. 10, fig. 20. Upper Miocene, Dominican Republic.

—— *decorata* Hussey, Jour. Paleontology, vol. 23, p. 128, p. 26, fig. 26. Middle Eocene, Louisiana. (NOTE: Preoccupied by Loeblich and Tappan, 1941, Bull. Am. Paleontology, vol. 26, no. 99, p. 8, pl. 1, fig. 5, from Lower Cretaceous of Texas.) Changed to: *Palmula elegantissima* nom. nov., Hussey, 1949, ut infra.

—— *dominicana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 157, pl. 10. figs. 17, 18. Middle Miocene, Dominican Republic.

—— *elegantissima* nom. nov., Hussey, in Thalmann, ibid., Contr., vol. 25, p. 102. For: *Palmula decorata* Hussey, 1949, ut supra.

—— *elongata* Bermudez, ibid., Spec. Pub. 25, p. 157, pl. 10, fig. 16. Upper Oligocene, Dominican Republic.

—— *longiforma* Bermudez, ibid., Spec. Pub. 25, p. 158, pl. 10, figs. 14, 15. Middle Miocene, Dominican Republic.

Parafrondicularia javana Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 86, pl. 7, fig. 11. Pliocene, Java.

Parafusulina durhami Thompson and Miller, Jour. Paleontology, vol. 23, p. 15, pl. 3, figs. 3–7; pl. 5, figs. 9, 11, 12. Permian, Colombia.

—— *kummeli* Roberts, Upper Paleozoic of Peru, Univ. Service Bureau, Columbia Univ., N. York, p. 236, pl. 43, figs. 1–6. Middle Permian (Leonardian), Peru.

—— *nancei* Thompson and Miller, Jour. Paleontology, vol. 23, p. 16, pl. 3, figs. 1, 2; pl. 5, figs. 1–6; pl. 6, figs. 1, 2. Permian, Venezuela.

—— *peruana* Roberts, Upper Paleozoic of Peru, Univ. Service Bureau, Columbia Univ., N. York, p. 234, p. 42, figs. 5–10. Middle Permian (Leonardian), Peru.

—— *trümpyi* Thompson and Miller, Jour. Paleontology, vol. 23, p. 18, pl. 4, figs. 1–3; pl. 5, figs. 7, 8, 10. Permian (float), Colombia.

PARAROTALIA Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 32. New genus of the family Rotaliidae. Genotype: *Rotalina inermis* Terquem, 1882, Soc. géol. France Mém., ser. 3, vol. 2, p. 68, pl. 6, fig. 1. Lutetian.

Paraschwagerina (*Acervoschwagerina*) *endoi* Hanzawa, Jour. Paleontology, vol. 23, p. 208, pl. 43, figs. A–D; text-figs. 2, 3. Lowest Permian (Sakmarian), Japan.

Parrella dominicana Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 272, pl. 21, figs. 4–6. Middle Oligocene, Dominican Republic.

Patellina ambigua Y. LeCalvez, Mém. Explic. Carte géol. gét. France, p. 14, pl. 1, figs. 7, 8. Lutetian, Paris Basin, France.

—— *lucida* Y. LeCalvez, ibid., p. 15, pl. 1, figs. 9, 10. Lutetian, Paris Basin, France.

PAVONINOIDES Bermudez, Cushman Lab. Foram. Res. Contr., vol. 25, p. 58. New genus of the family Miliolidae. Genotype: *Pavoninoides panamensis* Bermudez, ut infra. Oligocene (probable middle).

—— *panamensis* Bermudez, ibid., Contr., vol. 25, p. 58, text-fig. 1. Oligocene (probably middle), Panama Canal Zone.

Peneroplis senoniensis Hofker. Inst. Roy. Sci. Nat. Belgique Mém. 112, p. 41, text fig. 19. Upper Cretaceous (Maestrichtian), Holland.

Planorbulina dominicana Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 311, pl. 26, figs. 37–39. Middle Miocene, Dominican Republic.

—— *mabahethi* Said, ibid., Spec. Pub. 26, p. 44, pl. 4, fig. 26. Recent, northern Red Sea, 17–21 meters.

Planularia caribbeana nom. nov. Bermudez, ibid., Spec. Pub. 25, p. 136, pl. 8, figs. 49, 50. Upper Oligocene, Dominican Republic, New name for *Planularia cushmani* D. K. Palmer, 1940 (non Kleinpell, 1938) in: Palmer, 1940, Soc. Cubana Hist. Nat. Mem., vol. 14, p. 131, pl. 18, fig. 7; and in: Keijzer, 1945. Proefschr. (Thesis), Utrecht, p. 195, pl. 2, fig. 29; and for *Planularia species* (?) in: Cushman, 1930, Florida State Geol. Surv. Bull. 4, p. 26, pl. 4, fig. 6; and in: Cushman and Cahill, 1933, U. S. Geol. Surv. Prof. Paper 175-A, p. 13, pl. 4, fig. 4.

—— *dominicana* Bermudez, ibid., Spec. Pub. 25, p. 137, pl. 8, figs. 37, 38. Middle Miocene, Dominican Republic.

—— *gasparensis* Bermudez, ibid., Spec. Pub. 25, p. 137, pl. 8, figs. 47, 48. Upper Oligocene, Dominican Republic.

—— *leroyi* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 74, pl. 6, fig. 16. Miocene, Java.

—— *parva* Hussey, Jour. Paleontology, vol. 23, p. 125, pl. 26, fig. 5. Middle Eocene, Louisiana.

—— *stavensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 43, pl. 5, fig. 12. Upper Eocene (Jackson), Alabama.

—— *trinae* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 138, pl. 8, figs. 39, 40. Upper Oligocene, Dominican Republic.

Planulina subinflata Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 113, pl. 18, fig. 1. Oligocene, Alabama.

PLANULINELLA Sigal, Revue Inst. Franç. Pétrole et Ann. Comb. Liquides, vol. 4, no. 5, p. 158. New genus of the family Anomalinidae, subfamily Cibicidinae. Genotype: *Planulinella escornebovensis* Sigal, 1949, ut infra. Middle and upper Oligocene.

—— *escornebovensis* Sigal, ibid., vol. 4, p. 158, pl. 2, fig. 1; pl. 3, fig. 2. Aquitanian, France.

—— —— —— var. *obesa* Sigal, ibid., vol. 4, p. 159, pl. 2, fig. 2 (holotype); pl. 3, fig. 3–5; pl. 2, fig. 3. Aquitanian, France.

Plectina regularis Hussey, Jour. Paleontology, vol. 23, p. 119, pl. 26, figs. 3, 4. Middle Eocene, Louisiana.

—— *robusta* Hussey, ibid., vol. 23, p. 119, pl. 25, fig. 10. Middle Eocene, Louisiana.

—— *virginiana* Cushman and Cederstrom, Virginia Geol. Surv. Bull. 67 (1945, published April 15, 1949), p. 6, pl. 1, fig. 2. Upper Eocene, Virginia.

Plectofrondicularia keijzeri Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 175, pl. 11, figs. 49, 51. Middle Oligocene, Dominican Republic.

—— *virginiana* Cushman and Cederstrom, Virginian Geol. Surv. Bull. 67 (1945, published April, 15, 1949), p. 26, pl. 4, fig. 8. Upper Eocene, Virginia. (NOTE: This species was pre-published by Cushman, 1948, State of Maryland, Board Nat. Res., Dept. Geol. etc., Bull. 2, p. 234, pl. 18, fig. 9, from the Eocene of Maryland).

—— *vokesi* Cushman, R. E., and K. C. Stewart, Oregon Dept. Geol. and Min. Industr. Bull. 36, pt. 6, p. 132, p. 15, fig. 4. Upper Eocene, Oregon.

Pleurostomella schuberti Cushman and Harris, 1927, var. *dominicana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 230, pl. 14, figs. 67–70. Upper Miocene, Dominican Republic.

Polymorphina liosoma Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 65, pl. 9, fig. 7. Upper Eocene (Jackson), Alabama.

Polymorphinella gracilis Cushman and Cederstrom, Virginia Geol. Surv. Bull. 67, (1945, published April 15, 1949), p. 23, pl. 4, fig. 3. Upper Eocene, Virginia.

PREVERINA Frizzell, Jour. Paleontology, vol. 23, p. 489. New genus of the family Rotaliidae, subfamily Chapmanininae. Genotype: *Chapmania galea* Silvestri. 1923, R. Accad. Naz. Lincei, Atti, Rendic., Cl. fis. mat. nat., (5), vol. 32, sem. 2, nos. 3–4, p. 90, text-fig. 1. Middle Miocene, Italy. ? Oligocene to middle Miocene.

Profusulinella manuensis Roberts, Upper Paleozoic of Peru, Univ. Service Bureau, Columbia Univ. New York, p. 184, pl. 36, figs. 10, 11. Middle Pennsylvanian, Peru.

Proteonina harangensis Smith, Louisiana Geol. Surv. Bull. 26 (1948, issued 1949), p. 40, pl. 10, figs. 4, 5. Middle Miocene, Louisiana.

Pseudochrysalidina dominicana Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 100, pl. 5, figs. 84–96. Middle Eocene, Dominican Republic.

Pseudoclavulina distincta Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 55, pl. 4, fig. 6. Mio-Pliocene, Java.

—— *dominicana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 72, pl. 3, figs. 45, 46. Upper Oligocene, Dominican Republic.

Pseudocyclammina bukowiensis Cushman and Glazewski, ibid., Contr., vol. 25, p. 5, pl. 2, figs. 1, 2. Upper Jurassic (Portlandian), Poland.

—— *rogalai* Cushman and Glazewski, ibid., Contr., vol. 25, p. 6, pl. 2, figs. 3, 4. Upper Jurassic (Tithonian), Poland.

Pseudofusulina andina Roberts, Upper Paleozoic of Peru, Univ. Service Bureau, Columbia Univ. New York, p. 229, p. 41, figs. 6–8. Middle Permian (Leonardian), Peru.

—— *meloformata* Roberts, ibid., p. 231, pl. 42, figs. 1–4. Middle Permian (Leonardian), Peru.

—— *rasuvilcensis* Roberts, ibid., p. 227, pl. 41, figs. 3–5. Early Permian (Wolfcampian), Peru.

Pseudogaudryina ishikiensis Asano, Jour. Paleontology, vol. 23, p. 426, text-fig. 1, nos. 61–64. Miocene, Japan.

Pseudoglandulina fortis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 161, pl. 10, fig. 40. Upper Oligocene, Dominican Republic.

—— *obsoleta* Bermudez ibid., Spec. Pub. 25, p. 162, pl. 10, fig. 42. Middle Miocene, Dominican Republic.

—— *spinosa* Bermudez, ibid., Spec. Pub. 25, p. 163, pl. 10, fig. 44. Middle Oligocene, Dominican Republic.

—— *tenuistriata* Bermudez, ibid., Spec. Pub. 25, p. 163, pl. 10, fig. 45. Upper Miocene, Dominican Republic.

—— *virginiana* Cushman and Cederstrom, Virginia Geol. Surv. Bull. 67, (1945, issued 1949, April 15), p. 16, pl. 3, figs. 3, 4. Upper Eocene, Virginia.

PSEUDONODOSARIA Boomgart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 81. New genus of the family Lagenidae, subfamily Nodosariinae. Genotype: *Glandulina discreta* Reuss, 1850. [Incomplete indication given by the author, supplemented herewith: Denkschr. K. Akad. Wiss. Wien, Math-naturw. kl., vol. 1, p. 366, pl. 46, fig. 3 from the Miocene of Siebenbürgen). Miocene to Pliocene.

PSEUDONUBECULINA Bartenstein and Brand, Jour. Paleontology, vol. 23, p. 670. New genus of the family Miliolidae, subfamily Nubeculariinae. Genotype: *Nubecularia nodulosa* Chapman, 1891, Royal Micr. Soc. Jour., p. 9, pl. 9, fig. 2 from the Middle Cretaceous (Gault) of England. Lower and Middle Cretaceous.

Pseudoparrella japonica Asano, ibid., vol. 23, p. 430, text-fig. 2, nos. 2–4. Miocene, Japan.

Pseudopolymorphina plectilis Loeblich and Tappan, ibid., vol. 23, p. 260, pl. 50, fig. 3. Lower Cretaceous, Oklahoma.

Pseudoschwagerina ayacuchensis Roberts, Upper Paleozoic of Peru, Univ. Service Bureau, Columbia Univ. N. York, p. 211, pl. 41, figs. 1, 2. Early Permian (Wolfcampian), Peru.

—— *broggi* Roberts, ibid., p. 223, pl. 40, figs. 3–5. Early Permian (Wolfcampian), Peru.

—— *dallmusi* Thompson and Miller, Jour. Paleontology, vol., 23, p. 10, pl. 1, figs. 1–5; pl. 2, figs. 1–5. Permian, Colombia.

—— *vilcanotensis* Roberts, Upper Paleozoic of Peru, Univ. Service Bureau, Columbia Univ. N. York, p. 225, pl. 40, figs. 6–8. Early Permian (Wolfcampian), Peru.

Pullenia duplicata nom. nov., Stainforth, Jour. Paleontology, vol. 23, p. 436. New name for *Pullenia compressiuscula* auctorum (non Reuss, 1866). (NOTE: for list of synonymy consult original publication).

—— *quinqueloba* (Reuss, 1851), var. *aplata*

Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 79, pl. 12, fig. 5. Upper Eocene (Jackson), Alabama. For: *Pullenia quinqueloba angusta* Cushman 1946 (non Cushman and Todd, 1943), Cushman Lab. Foram. Res. Spec. Pub. 16, p. 37, pl. 7, fig. 11.

Pulvinulinella bella Hussey, Jour. Paleontology, vol. 23, p. 140, pl. 28, figs. 1–3. Middle Eocene, Louisiana. (NOTE: should be assigned to the genus *Pseudoparrella*).

Pyrgo magnacaudata Smith, Louisiana Geol. Surv. Bull. 26 (1948, issued 1949), p. 58, pl. 11, figs. 14–16. Middle Miocene, Louisiana.

—— *subalata* Cuvillier and Szakall, Foram. d'Aquitaine, pt. 1, p. 45, pl. 19, fig. 9. Upper Eocene to Stampian, France.

Quadratina euthemon Loeblich and Tappan, Jour. Paleontology, vol. 23, p. 259, pl. 49, fig. 14. Lower Cretaceous, Oklahoma.

Quinqueloculina acuta Hussey, ibid., vol. 23, p. 120, pl. 25, figs. 17, 18. Middle Eocene, Louisiana.

—— *amygdulata* Hussey, ibid., vol. 23, p. 120, pl. 25, figs. 19, 20. Middle Eocene, Louisiana.

—— *anguina* Terquem, 1878, var. *arenata* nom. nov., Said, Cushman Lab. Foram. Res. Spec. Pub. 26, p. 9, pl. 1, fig. 25. Recent, Gulf of Suez, northern Red Sea, 59–450 meters. New name for: *Miliolina* (*Quinqueloculina*) *anguina* Terquem var. *agglutinans* Wiesner in: Heron-Allen and Earland, 1915, Zool. Soc. London Trans., vol. 20, p. 575; Cushman, 1904, Carnegie Inst. Washington Publ. 342, p. 60, pl. 22, figs. 5, 6; and Cushman, 1932, U. S. Nat. Mus. Bull. 161, pt. 1, p. 18, pl. 5, fig. 1.

—— *constans* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 18, pl. 1, fig. 4. Upper Eocene (Jackson), Alabama.

—— *fragilissima* Hussey, Jour. Paleontology, vol. 23, p. 121, pl. 25, figs. 16, 21. Middle Eocene, Louisiana.

—— *gibbosa* Hussey, ibid., vol. 23, p. 120, pl. 25, figs. 24, 25. Middle Eocene, Louisiana.

—— *mauricensis* Howe, 1939, var. *apertaexpansa* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 20, pl. 1, fig. 9. Eocene (Claiborne), Alabama.

—— *mosharrafai* Said, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 10, pl. 2, fig. 23. Recent, northern Red Sea, 17–21 meters.

—— *multimarginata* Said, ibid., Spec. Pub. 25, p. 10, pl. 1, fig. 34. Recent, Gulf of Suez, northern Red Sea, 64 meters.

—— *parvitriangularis* Hussey, Jour. Paleontology, vol. 23, p. 121, pl. 25, figs. 14, 15. Middle Eocene, Louisiana.

—— *stavensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 21, pl. 2, fig. 2. Upper Eocene (Jackson), Alabama.

—— *striaturata* Hussey, Jour. Paleontology, vol. 23, p. 120, pl. 25, figs. 22, 23. Middle Eocene, Louisiana.

—— *subgibbosa* Hussey, ibid., vol. 23, p. 120, pl. 25, figs. 26, 27. Middle Eocene, Louisiana.

—— *substriata* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 21, pl. 2, fig. 2. Upper Eocene (Jackson), Alabama.

—— *yaguatensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 103, pl. 6, fig. 4. Middle Oligocene, Dominican Republic.

Ramulina globulifera Brady, 1879, var. *pulchra* Bermudez, ibid., Spec. Pub. 25, p. 164, pl. 11, fig. 12. Middle Miocene, Dominican Republic.

—— *muricatina* Loeblich and Tappan, Jour. Paleontology, vol. 23, p. 261, p. 50, figs. 5, 6. Lower Cretaceous, Oklahoma. (NOTE: for synonymy see original publication).

—— *polita* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 165, pl. 11, figs. 13, 14. Upper Miocene, Dominican Republic.

Rectobolivina glabra Bermudez, ibid., Spec. Pub. 25, p. 197, pl. 12, fig. 55. Middle Miocene, Dominican Republic.

—— *gasparensis* Bermudez, ibid., Spec. Pub. 25, p. 197, pl. 12, fig. 54. Upper Oligocene, Dominican Republic.

Recurvoides azuaensis Bermudez, ibid., Spec. Pub. 25, p. 49, pl. 1, figs. 35–37. Upper Oligocene, Dominican Republic.

—— *gillieparkeri* Smith, Louisiana Geol. Surv. Bull. 26, (1948, published 1949), p. 46, pl. 10, figs. 1–3. Middle Miocene, Louisiana.

—— *trincherasensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 50, pl. 1, figs. 32–34. Upper Oligocene, Dominican Republic.

Reophax acosta Bermudez, ibid., Spec. Pub. 25, p. 47, pl. 1, figs. 28–31. Upper Miocene, Dominican Republic. (NOTE: the species name should be spelled *acostai*).

—— *angoti* Cuvillier and Szakall, Foram. d'Aquitaine, pt. 1, p. 5, pl. 1, fig. 1. Lower Miocene, France.

—— *beaurecarsoni* Smith, Louisiana Geol. Surv. Bull. 26 (1948, published 1949), p. 42, pl. 12, fig. 5. Middle Miocene, Louisiana.

—— *davepopei* Smith, ibid., Bull. 26, p. 42, pl. 11, figs. 7, 8. Middle Miocene, Louisiana.

—— *payenborchella* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 43, pl. 1, fig. 4. Pliocene, Java.

Reussella costata Hussey, Jour. Paleontology, vol. 23, p. 133, pl. 27, fig. 3. Middle Eocene, Louisiana.

—— *moodysensis* Bandy. Bull. Am. Paleontology, vol. 32, no. 131, p. 133, pl. 25, fig. 13. Upper Eocene (Jackson), Alabama.

Robertina howei Hussey, Jour. Paleontology, vol. 23, p. 131, pl. 27, figs. 6, 7. Middle Eocene, Louisiana.

Robulus abuillotensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 119, pl. 8, figs. 1, 2. Lower Eocene, Haiti.

—— *acosta* Bermudez, ibid., Spec. Pub. 25, p. 119, pl. 8, figs. 7, 8. Upper Oligocene. Dominican Republic. (NOTE: the specific name should correctly be spelled: *acostai*).

—— *aquitanicus* Cuvillier and Szakall, Foram. d'Aquitaine, pt. 1, p. 57, pl. 22, fig. 10. Miocene, France.

—— *bonnardi* Cuvillier and Szakall, ibid., pt. 1, p. 56, pl. 21, fig. 5. Lower Lutetian, France.

—— *bulbosus* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 121, pl. 7, figs. 17, 18. Upper Oligocene, Dominican Republic.

—— *caritae* Bermudez, ibid., Spec. Pub. 25, p. 122, pl. 7, figs. 35, 36. Middle Oligocene, Dominican Republic.

—— *claratus* nom. nov. Hussey in Thalmann, ibid., Contr., vol. 25, p. 102. For: *Robulus translucidus* Hussey, 1949 ut infra.

—— *cristobalensis* Bermudez, ibid., Spec. Pub. 25, p. 123, pl. 7, figs. 19, 20. Middle Oligocene, Dominican Republic.

—— *davisi* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 59, pl. 8, fig. 4. Upper Eocene (Jackson), Alabama.

—— *dissimilis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 125, pl. 7, figs. 15, 16. Upper Oligocene, Dominican Republic.

—— *dominicanus* Bermudez, ibid., Spec. Pub. 25, p. 125, pl. 7, figs. 3, 4. Upper Eocene, Dominican Republic.

—— *euglypheus* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 59, pl. 7, fig. 7. Upper Eocene (Jackson), Alabama. For: (?)*Robulus dumblei* Cushman, 1946 (non Weinzierl and Applin, 1929), Cushman Lab. Foram. Res. Spec. Pub. 16, p. 10, pl. 2, fig. 9.

—— *guazumalensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 127, pl. 6, figs. 69, 70. Upper Oligocene, Dominican Republic.

—— *intusvortex* Bermudez, ibid., Spec. Pub. 25, p. 127, pl. 7, figs. 25, 26. Upper Oligocene, Dominican Republic.

—— *javanus* (R. E. Koch, 1923) var. *indicus* nom. nov. Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 70. Miocene, East Borneo. New name for: *Cristellaria javana* Koch, 1923, var. *simplex* Koch, 1926 (non *Cristellaria simplex* d'Orbigny, 1846), Eclogae geol. Helvetiae, vol. 19, p. 736, text-fig. 13.

—— *limbatus* Hussey, Jour. Paleontology, vol. 23, p. 124, pl. 25, fig. 13. Middle Eocene, Louisiana. (NOTE: Preoccupied by *Robulina limbata* Bornemann, 1855, Deutsche geol. Gesell Zeitschr., vol. 7, p. 335, pl. 15, figs. 4–6, from the Oligocene of Germany). Changed to the following new name:

—— *pachysuturalis* nom. nov. Hussey, in: Thalmann, Cushman Lab. Foram. Res. Contr., vol. 25, p. 102.

—— *platensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 130, pl. 7, figs. 59, 60. Middle Miocene, Dominican Republic.

—— *rectidorsatus* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 62, pl. 8, fig. 5. Upper Eocene (Jackson), Alabama.

—— *translucidus* Hussey, Jour. Paleontology, vol. 23, p. 125, pl. 25, fig. 6. Middle Eocene, Louisiana. [Preoccupied by *Cristellaria* (*Robulus*) *translucida* d'Orbigny, 1826, teste Fornasini, 1902, Sci. Nat. R. Accad. Bologna Mem. (5), vol. 10, p. 41. text fig. 40.] Changed to: *Robulus claratus* nom. nov., Hussey 1949, ut supra.

—— *trinae* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 131, pl. 8, figs. 5, 6. Upper Oligocene, Dominican Republic.

—— *trochoides* Hussey, Jour. Paleontology, vol. 23, p. 124, pl. 25, fig. 11. Middle Eocene, Louisiana.

—— *umbonatus* Hussey, ibid., vol. 23, p. 124, pl. 25, fig. 12. Middle Eocene, Louisiana. (NOTE: Preoccupied by *Robulina umbonata* Reuss, 1851, Deutsche geol. Gesell. Zeitschr., vol. 3, p. 68, pl. 4, fig. 24 from the Oligocene of Germany). Changed to: *Robulus vitrealis* nom. nov. Hussey, 1949, ut infra.

—— *virginianus* Cushman and Cederstrom, Virginia Geol. Surv. Bull. 67 (1945, issued April 15, 1949), p. 10, pl. 1, fig. 3. Upper Eocene, Virginia. [NOTE: This species was prepublished by Cushman, 1948, State of Maryland, Board of Nat. Res., Dept. Geol. etc., Bull 2, p. 236, pl. 18, fig. 23 from the Eocene of Maryland. Since the actual date of publication is the 15th of April 1949, this species becomes a homonym of *Robulus midwayensis* (Plummer, 1927) var. *virginianus* Shifflett, 1948, Maryland Board Nat. Res., Geol. Dept. etc., Bull. 3, p. 48, pl. 1, figs. 15, 16, from the lower Eocene of Virginia.]

—— *vitrealis* nom. nov. Hussey, in: Thalmann, Cushmann Lab. Foram. Res. Contr., vol. 25, p. 102. For: *Robulus umbonatus* Hussey, 1949, ut supra.

—— *yaguatensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 132, pl. 7, figs. 29, 30. Upper Oligocene, Dominican Republic.

—— *yaquensis* Bermudez, ibid., Spec. Pub. 25, p. 132, pl. 7, figs. 29, 30. Upper Oligocene, Dominican Republic.

Rotalia similis Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 90, pl. 15, fig. 2. Lower Oligocene, Alabama.

Rotorbinella packardi Bandy, ibid., vol. 32, no. 131, p. 90, pl. 15, fig. 1. Lower Oligocene, Alabama.

Rugosofusulina incaica Roberts, Upper Paleozoic of Peru, Univ. Service Bureau, Columbia Univ. N. York, p. 217, pl. 39, figs. 10–13. Early Permian (Wolfcampian), Peru.

Saracenaria dohmi Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 153, pl. 9, figs. 11, 12. Upper Oligocene, Dominican Republic.

—— *italica* Defrance, 1824, var. *maoensis* Bermudez, ibid., Spec. Pub. 25, p. 143, pl. 8, figs. 59, 60. Upper Miocene, Dominican Republic.

—— *limbata* Hussey, Jour. Paleontology, vol. 23, p. 126, pl. 26, figs. 15, 18. Middle Eocene, Louisiana.

—— *ornatula* Cushman and Bermudez, 1937, var. *regia* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 40, pl. 5, fig. 9. Upper Eocene (Jackson), Alabama.

—— *parva* Hussey, Jour. Paleontology, vol. 23, p. 126, pl. 26, fig. 13. Middle Eocene, Louisiana.

—— *perforata* Hussey, ibid., vol. 23, p. 125, pl. 26, fig. 14. Middle Eocene, Louisiana.

—— *stavensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 41, pl. 5, fig. 10. Lower Oligocene, Alabama.

—— *toddae* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 154, pl. 9, figs. 3–6. Middle Miocene, Dominican Republic. [For: *Saracenaria cushmani* D. K. Palmer, 1945 (non

Tappan, 1940), Bull. Am. Paleontology, vol. 29, no. 115, p. 38, pl. 1, fig. 5.]

Schubertella australis Thompson and Miller, Jour. Paleontology, vol. 23, p. 9, pl. 1, figs. 6–8. Permian, Colombia.

Schwagerina bowmani Roberts, Upper Paleozoic of Peru, Univ. Service Bureau, Columbia Univ. N. York, p. 214, pl. 39, figs. 7–9. Early Permian (Wolfcampian), Peru.

—— *brouweri* Thompson, Jour. Paleontology, vol. 23, p. 187, pl. 34, figs. 4(?), 5–14; pl. 35, fig. 9. Permian, Timor, Indonesia. [For: *Fusulina granum-avenae* Schubert, 1915, Paläont. von Timor, Lief. 2, p. 53, pl. 41, fig. 6 (non pl. 39, fig. 1, nec pl. 41, fig. 5].

—— *oxia* Roberts, Upper Paleozoic of Peru, Univ. Service Bureau, Columbia Univ. N. York, p. 211, pl. 39, figs. 4–6. Early Permian (Wolfcampian), Peru.

—— *tintensis* Roberts, ibid., p. 213, pl. 39, figs. 1–3. Early Permian (Wolfcampian), Peru.

Schwagerina ? hedbergi Thompson and Miller, Jour. Paleontology, vol. 23, p. 13, pl. 7, figs. 1–7. Permian, Colombia.

Sigmoidella lisbonensis Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 66, pl. 9, fig. 9. Eocene (Claiborne), Alabama.

Sigmoilina cibaoensis Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 105, pl. 6, figs. 29, 30. Middle Miocene, Dominican Republic.

—— *dominicana* Bermudez, ibid., Spec. Pub. 25, p. 106, pl. 5, figs. 27, 28. Middle Miocene, Dominican Republic.

—— *hispaniolana* Bermudez, ibid., Spec. Pub. 25, p. 106, pl. 6, fig. 31. Upper Oligocene, Dominican Republic.

—— *maoensis* Bermudez, ibid., Spec. Pub. 25, p. 107, pl. 6, figs. 25, 26. Middle Miocene, Dominican Republic.

—— *rustica* Bermudez, ibid., Spec. Pub. 25, p. 107, pl. 6, figs. 23, 24. Middle Miocene, Dominican Republic.

Siphogenerina acuta Bermudez, ibid., Spec. Pub. 25, p. 220, pl. 14, figs. 7, 8. Middle Oligocene, Dominican Republic.

—— *solitaria* Cushman and Stone, ibid., Contr., vol. 25, p. 55, pl. 10, figs. 7, 8. Middle Eocene, Peru.

—— *spinea* Bermudez, ibid., Spec. Pub. 25, p. 223, pl. 13, figs. 78, 79. Middle Oligocene, Dominican Republic.

—— *spinulosa* Hussey, Jour. Paleontology, vol. 23, p. 132, pl. 27, fig. 13. Middle Eocene, Louisiana.

—— *stonei* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 223, pl. 14, figs. 19, 20. Middle Oligocene, Dominican Republic.

—— *taberana* Bermudez, ibid., Spec. Pub. 25, p. 224, pl. 14, figs. 16, 17. Middle Oligocene, Dominican Republic.

—— *transversa* Cushman, 1918, var. *horquetensis* Bermudez, ibid., Spec. Pub. 25, p. 224, pl. 14, figs. 4, 5. Middle Oligocene, Dominican Republic.

Siphonina cibaoensis Bermudez, ibid., Spec. Pub. 25, p. 243, pl. 16, figs. 31–33. Upper Miocene, Dominican Republic.

—— *umbonata* Hussey, Jour. Paleontology, vol. 23, p. 137, pl. 29, figs. 2, 3. Middle Eocene, Louisiana.

Siphoninella parva Hussey, ibid., vol. 23, p. 138, pl. 29, fig. 1. Middle Eocene, Louisiana.

Sphaeroidina ciperana Cushman and Todd, Cushman Lab. Foram. Res. Contr., vol. 25, p. 19, not figured, only described. For: *Sphaeroidina variabilis* Cushman and Stainforth, 1945 (non Reuss, 1851), Cushman Lab. Foram. Res. Spec. Pub. 14, p. 67, pl. 12, fig. 14. Oligocene, Trinidad, B.W.I.

—— *compacta* Cushman and Todd, ibid., Contr., vol. 25, p. 19, pl. 4, fig. 14. Recent, Gulf of Mexico, 1002 fathoms. For: *Sphaeroidina bulloides* Cushman, 1914 (non d'Orbigny, 1826), U. S. Nat. Mus. Bull. 71, pt, 4, p. 18, pl. 12, fig. 1.

—— *compressa* Cushman and Todd, ibid., Contr. vol. 25, p. 20, pl. 4, figs. 15, 16. Recent, Pacific, off New Zealand, 60 fathoms.

—— *nitida* Cushman and Todd, ibid., Contr. vol. 25, p. 20, pl. 4, fig. 13. Recent, Pacific, off Mindanao, Philippine Islands.

Spirillina cristata Y. LeCalvez, Mém. Explic. Carte géol. dét. France, p. 13, pl. 1, figs. 5, 6. Lutetian, Paris Basin, France.

—— *simplex* Y. LeCalvez, ibid., p. 13, pl. 1, figs. 1, 2. Lutetian, Paris Basin, France.

SPIROCYCLININAE Maync, Eclogae geol. Helvetiae, vol. 42, no. 2, 1949 (published summer 1950). New subfamily of the family Lituolidae. Comprises the genera: *Choffatella* Schlumberger, 1904; (Lower Cretaceous); *Cyclammina* Brady, 1876 (Lower Cretaceous to Recent); *Dictyopsella* Munier-Chalmas, 1899 (Upper Cretaceous); *Pseudocyclammina* Yabe and Hanzawa, 1926 (upper Jurassic to Lower Cretaceous); *Spirocyclina* Munier-Chalmas, 1887 (upper Jurassic to Lower Cretaceous) and *Yaberinella* Vaughan, 1928 (middle and upper Eocene).

Spiroloculina communis Cushman and Todd, 1944, var. *convexa* Said, Cushman Lab. Foram. Res. Spec. Pub. 26, p. 15, pl. 1, fig. 38. Recent, northern Red Sea, 92–400 meters.

—— *elegantissima* Said, ibid., Spec. Pub. 26, p. 15, pl. 1, fig. 41. Recent, Gulf of Suez, northern Red Sea, 62 meters.

—— *eocenica* Cuvillier and Szakall, Foram. d'Aquitaine, pt. 1, p. 40, pl. 18, fig. 7. Lower Lutetian, France.

—— *lamposa* Hussey, Jour. Paleontology, vol. 23, p. 121, pl. 26, fig. 6. Middle Eocene, Louisiana.

—— *lisbonensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 18, pl. 1, fig. 3. Eocene (Claiborne), Alabama.

—— *nummiformis* Said, Cushman Lab. Foram. Res. Spec. Pub. 26, p. 16, pl. 1, fig. 39. Recent, Gulf of Suez, northern Red Sea, 62 meters.

—— *ocularis* Smith, Louisiana Geol. Surv. Bull. 26 (1948, issued 1949), p. 57, pl. 9, figs. 3, 4. Middle Miocene, Louisiana.

—— *toddae* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 105, pl. 6, fig. 15. Middle Oligocene, Dominican Republic.

Spiroplectammina abuillotensis Bermudez, ibid., Spec. Pub. 25, p. 53, pl. 1, figs. 74, 75. Lower Eocene, Haiti.

— *adanaensis* Izgi (Tasman), Maden tetk. ve Arama Enstit. Yayinl. Ankara (B), no. 15, p. 15, pl. 1, fig. 1. Miocene, Turkey.

—— *alabamensis* (Cushman, 1923) var. *diminutiva* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 33, pl. 4, fig. 8. Eocene (Claiborne), Alabama.

—— *caribbeana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 54, pl. 1, figs. 76, 77. Lower Eocene, Haiti.

—— *cuyleri* Izgi (Tasman), Maden tetk. ve Arama Enstit. Yayinl. Ankara (B), no. 15, p. 16, pl. 1, fig. 2. Miocene, Turkey.

—— *gracilenta* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 33, pl. 4, fig. 7. Upper Eocene (Jackson), Alabama.

—— *grossefinale* Smith, Louisiana Geol. Surv. Bull. 26 (1948, issued 1949), p. 53, pl. 12, figs. 6, 7. Middle Miocene, Louisiana.

—— *latior* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 33, pl. 4, fig. 6. Lower Oligocene, Alabama.

—— *pseudoelongata* Bandy, ibid., vol. 32, Nr. 131, p. 34, pl. 4, fig. 9. Upper Eocene (Jacksonian), Alabama. For: (?) *Textularia mississippiensis* Cushman, 1922, var. *elongata* Davis, 1941 (non Hagenow, 1942, nec Cornuel, 1848, nec d'Orbigny, 1852), Jour. Paleontology, vol. 15, p. 151, pl. 24, fig. 21.

—— *tortuosa* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 49, pl. 2, fig. 8. Miocene, Java.

—— *waughi* Smith, Louisiana Geol. Surv. Bull. 26 (1948, published 1949), p. 53, pl. 11, figs. 3, 4. Middle Miocene, Louisiana.

SPOROBULIMINA Stone, Jour. Paleontology, vol. 23, p. 82. New genus of the family Buliminidae, subfamily Bulimininae. Genotype: *Sporobulimina perforata* Stone, 1949, ut infra. Upper Cretaceous.

—— *perforata* Stone, ibid., vol. 23, p. 82, pl. 21, figs. 1–3. Upper Cretaceous, Peru.

SPOROBULIMINELLA Stone, ibid., vol. 23, p. 81. New genus of family Buliminidae, subfamily Bulimininae. Genotype: *Sporobuliminella stainforthi* Stone, 1949, ut infra. Upper Cretaceous.

—— *stainforthi* Stone, ibid., vol. 23, p. 81, pl. 21, figs. 4–7. Upper Cretaceous, Peru.

Stichocassidulina peruviana Stone, ibid., vol. 23, p. 83, pl. 21, fig. 8. Upper Eocene, Peru.

Stichocibicides aricki Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 309, pl. 26, figs. 34–36. Lower Eocene, Haiti.

Streblus dominicana Bermudez, ibid., Spec. Pub. 25, p. 234, pl. 15, figs. 52–54. Upper Oligocene, Dominican Republic. (NOTE: the gender of the genus is masculine.)

—— *mineacea* Bermudez, ibid., Spec. Pub. 25, p. 234, pl. 16, figs. 1–3. Upper Miocene, Dominican Republic.

TETRAPLASIA Bartenstein and Brand, Jour. Paleontology, vol. 23, p. 672. New genus of the family Lituolidae. Genotype: *Tetraplasia georgsdorfensis* Bartenstein and Brand, 1949, ut infra. Lower Cretaceous (Valanginian to Hauterivian).

—— *georgsdorfensis* Bartenstein and Brand, ibid., vol. 23, p. 23, text-fig. 9. Lower Cretaceous (Valanginian and Hauterivian), Northern Germany. For: *Haplophragmium murchisoni* Beissel, 1891 (non Reuss, 1854, *Triplasia*), Abhandl. k. Preuss. Geol. Landesanst., N. F. Heft 3, p. 15, pl. 4, figs. 2, 5, 9.

Textularia aegyptica Said, Cushman Lab. Foram. Res. Spec. Pub. 26, p. 5, pl. 1, fig. 2. Recent, Gulf of Suez, northern Red Sea, 59–64 meters.

—— *aquitanica* Cuvillier and Szakall, Foram. d'Aquitaine, pt. 1, p. 17, pl. 3, fig. 3. Lower Miocene, France.

—— *assimilis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 57, pl. 2, figs. 31–33. Middle Oligocene, Dominican Republic.

—— *azuana* Bermudez, ibid., Spec. Pub. 25, p. 58, pl. 2, figs. 66–68. Upper Oligocene, Dominican Republic.

—— *barnetti* Bermudez, ibid., Spec. Pub. 25, p. 58, pl. 2, figs. 1, 2. Middle Oligocene, Dominican Republic.

—— *canaensis* Bermudez, ibid., Spec. Pub. 25, p. 59, pl. 2, figs. 25–27. Middle Miocene, Dominican Republic.

—— *cushmani* Said, ibid., Spec. Pub. 26, p. 7, pl. 1, fig. 13. Recent, northern Red Sea, 512 meters.

—— *dibollensis* Cushman and Applin, 1926, var. *stavensis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 37, pl. 3, fig. 11. Eocene (Claiborne), Alabama.

—— *dominicana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 60, pl. 2, figs. 60–62. Middle Miocene, Dominican Republic.

—— *hispaniolana* Bermudez, ibid., Spec. Pub. 25, p. 62, pl. 2, figs. 49, 50. Upper Oligocene, Dominican Republic.

—— *jordanae* Izgi (Tasman), Maden tetk. ve Arama Enstit. Yayinl. Ankara (B), no. 15, p. 16, pl. 1, fig. 3. Miocene, Turkey.

—— *kerimbaensis* nom. nov., Said, Cushman Lab. Foram. Res. Spec. Pub. 26, p. 6, pl. 1, fig. 8. Recent, northern Red Sea, 17–433 meters. New name for: *Textularia conica* d'Orb. var. *corrugata* Heron-Allen and Earland, 1915 (non *T. corrugata* Costa, 1857), Zool. Soc. London Trans., vol. 20, p. 629, pl. 47, figs. 24–27. for *Textularia corrugata* Cushman, 1932 (non Costa, 1857), U. S. Nat. Mus. Bull. 161, pt. 1, p. 12, pl. 3, figs. 2, 4; and for *Textularia corrugata* Lalicker and McCulloch, 1940, (non Costa, 1857), Allan Hancock Pacific Exped., vol. 6, no. 2, p. 126, pl. 14, fig. 9.

—— *negra* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 51, pl. 3, fig. 3. Pliocene, Java.

—— *palmerae* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 64, pl. 2, figs. 17–20. Lower Miocene, Dominican Republic.

—— *rubra* Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 52, pl. 3, fig. 4. Miocene, Java.

—— *tasmani* Izgi (Tasman), Maden tetk. ve

Arama Enstit. Yayinl. Ankara (B), no. 15, p. 16, pl. 1, fig. 4. Miocene, Turkey.
—— *vautrini* Cuvillier and Szakall, Foram. d'Aquitaine, pt. 1, p. 16, pl. 5, fig. 7. Lower Miocene, France.
—— *yaguatensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 64, pl. 2, figs. 63–65. Upper Oligocene, Dominican Republic.
—— *yasicaensis* Bermudez, ibid., Spec. Pub. 25, p. 65, pl. 2, figs. 37, 38. Middle Miocene, Dominican Republic.
Textulariella polygona Hussey, Jour. Paleontology, vol. 23, p. 119, pl. 25, fig. 8. Middle Eocene, Louisiana.
TICINELLA Reichel, Eclogae geol. Helvetiae, vol. 42, no. 2, 1949 (published summer 1950), p. 600. New subgenus of the genus *Globotruncana* Cushman, 1927. Family Globorotaliidae. Genotype: *Anomalina roberti* Gandolfi, Riv. italiana paleontologia, Anno 48, Mem. 4, p. 100, pl. 2, fig. 2. Upper Cretaceous [Cenomanian].
Triloculina asymmetrica Said, Cushman Lab. Foram. Res. Spec. Pub. 26, p. 18, pl. 2, fig. 11. Recent, northern Red Sea, 24 meters.
—— *pinguis* nom. nov. Bandy, Jour. Paleontology, vol. 23, p. 440. New name for *Triloculina subrotunda* Bandy, 1949, ut infra. Upper Eocene (Jackson), Alabama.
—— *subrotunda* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 23, pl. 1, fig. 10. Upper Eocene (Jackson), Alabama. [NOTE: On account of homonymy with *Vermiculum* (*Triloculina*) *subrotundum* Montagu, 1803, Test. Brit., p. 251 the author renamed the species *T. pinguis* ut supra.]
—— *subtumidifrons* Bandy, ibid., vol. 32, no. 131, p. 23, pl. 2, fig. 10. Upper Eocene (Jackson), Alabama.
—— *terquemiana* (Brady, 1884), var. *laevis* Said, Cushman Lab. Foram. Res. Spec. Pub. 26, p. 19, pl. 2, fig. 15. Recent, northern Red Sea, 92–400 meters.
Trimosina guraboensis Bermudez, ibid., Spec. Pub. 25, p. 199, pl. 12, fig. 60. Middle Miocene, Dominican Republic.
Tritaxilina suturata Bermudez, ibid., Spec. Pub. 25, p. 95, pl. 5, figs. 63, 64. Middle Oligocene, Dominican Republic.
—— *yasicaensis* Bermudez, ibid., Spec. Pub. 25, p. 96, pl. 5, figs. 55, 56. Middle Miocene, Dominican Republic.
Triticites nitens Dunbar and Newell, 1946, subspec. *subnitens* Roberts, Upper Paleozoic of Peru, Univ. Service Bureau, Columbia Univ., New York, p. 197, pl. 37, fig. 6. Early Permian (Wolfampian), Peru.
—— *pajerensis* Roberts, ibid., p. 193, pl. 37, figs. 3–5. Early Permian (Wolfcampian), Peru.
—— *peruensis* Roberts, ibid., p. 195, pl. 36, figs. 21–23. Early Permian (Wolfcampian), Peru.
—— *pillahuarensis* Roberts, ibid., p. 191, pl. 37, figs. 1, 2. Early Permian (Wolfcampian), Peru.
Trochammina asagaiensis Asano, Jour. Paleontology, vol. 23, p. 474, text-fig. 1, nos. 2–4. Upper Oligocene, Japan.
—— *lafourchensis* Smith, Louisiana Geol. Survey Bull. 26 (1948, issued 1949), p. 59, pl. 11, figs. 5, 6. Middle Miocene, Louisiana. (NOTE: Published under the name of *Trochammina howei* n. sp. on p. 59, but species name changed on accompanying errata sheet to *T. lafourchensis* n. sp. on account of homonymy with *T. howei* Cushman, 1944.)
—— *trincherasensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 114, pl. 1, figs. 38–40. Upper Oligocene, Dominican Republic.
Trochamminoides discotrochus Smith, Louisiana Geol. Survey Bull. 26 (1948, published 1949), p. 43, pl. 11, fig. 2. Middle Miocene, Lousiana.
—— *novolateralis* Smith, ibid., Bull. 26, p. 44, pl. 11, fig. 1. Middle Miocene, Louisiana.
—— *thompsoni* Smith, ibid., Bull. 26, p. 45, pl. 11, fig. 9. Middle Miocene, Louisiana.
Trocholina arabica nom. nov., Henson, Annals and Mag. Nat. History, ser. 12, vol. 2, p. 173. New name for: *Trocholina intermedia* Henson, 1947 (1948), (non Frentzen, 1941), Annals and Mag. Nat. History, ser. 11, vol. 14, p. 454, pl. 11, fig. 2; pl. 12, fig. 10. Upper Cretaceous (lower Cenomanian), Arabia.
TRUNCOROTALIA Cushman and Bermudez, Cushman Lab. Foram. Res. Contr. vol. 25, p. 35. New subgenus of *Globorotalia* Cushman, 1927. Family Globorotaliidae. Subgenotype: *Rotalina truncatulinoides* d'Orbigny, 1839, in Barker, Webb, and Berthelot, Hist. Nat. Iles Canaries, vol. 2, pt. 2, "Foraminifères," p. 132, pl. 2, figs. 25–27. Upper Cretaceous to Eocene; Recent.
TURBOROTALIA Cushman and Bermudez, ibid., Contr. vol. 25, p. 42. New subgenus of Globorotalia Cushman, 1927. Family Globorotaliidae. Subgenotype: *Globorotalia centralis* Cushman and Bermudez, 1937, Cushman Lab. Foram. Res. Contr., vol. 13, p. 26, pl. 2, figs. 62–65. Upper Eocene, middle and upper Oligocene, Recent.
Uvigerina adelinensis nom. nov. Palmer and Bermudez, in Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 203. Lower Oligocene, Cuba. New name for: *Uvigerina cubana* Palmer and Bermudez, 1936 (non *U. gardnerae* Cushman var. *cubana* Hadley, 1934), Soc. cubana hist. nat. Mem., vol. 10, p. 292, pl. 17, figs. 5, 6.
—— *azuana* Bermudez, ibid., Spec. Pub. 25, p. 200, pl. 13, fig. 18. Lower Miocene, Dominican Republic.
—— *banicaensis* Bermudez, ibid., Spec. Pub. 25, p. 201, p. 13, fig. 14. Upper Oligocene, Dominican Republic.
—— *bealli* Bermudez, ibid., Spec. Pub. 25, p. 201, pl. 13, fig. 5. Middle Oligocene, Dominican Republic.
—— *bullardi* Izgi (Tasman), Maden tetk. ve Arama Enstit. Yayinl, Ankara (B), no. 15, p. 37, pl. 6, fig. 2. Miocene, Turkey.
—— *comendadorensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 202, pl. 13, fig. 17. Upper Oligocene, Dominican Republic.
—— *gasparensis* Bermudez, ibid., Spec. Pub. 25, p. 205, pl. 13, figs. 2, 3. Upper Oligocene, Dominican Republic.
—— *guayacanensis* Bermudez, ibid., Spec. Pub.

25, p. 205, pl. 13, fig. 12. Basal Middle Oligocene, Dominican Republic.

—— *hispaniolana* Bermudez, ibid., Spec. Pub. 25, p. 205, pl. 13, fig. 40. Middle Oligocene, Dominican Republic.

—— *incisa* Bermudez, ibid., Spec. Pub. 25, p. 206, pl. 13, fig. 6. Upper Oligocene, Dominican Republic.

—— *laeviaplicata* Bermudez, ibid., Spec. Pub. 25, p. 207, pl. 13, fig. 22. Upper Oligocene, Dominican Republic.

—— *maoensis* Bermudez, ibid., Spec. Pub. 25, p. 207, pl. 13, figs. 15, 16. Upper Miocene, Dominican Republic. For: *Uvigerina beccarii* Fornasini in: Coryell and Rivero, 1940, Jour. Paleontology, vol. 14, p. 342, pl. 44, fig. 25.

—— *microspinosa* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 142, pl. 27, fig. 7. Upper Eocene (Jackson), Alabama.

—— *minuta* Cushman and Stone, Cushman Lab. Foram. Res. Contr. vol. 25, p. 54, pl. 10, figs. 5, 6. Middle Eocene, Peru.

—— *nana* Bermudez, ibid., Spec. Pub. 25, p. 208, pl. 13, fig. 21. Upper Oligocene, Dominican Republic.

—— *quisqueyana* Bermudez, ibid., Spec. Pub. 25, p. 210, pl. 13, fig. 13. Upper Miocene, Dominican Republic.

—— *rivasensis* Bermudez, ibid., Spec. Pub. 25, p. 210, pl. 13, fig. 4. Middle Miocene, Dominican Republic.

—— *shukrii* Said, ibid., Spec. Pub. 26, p. 31, pl. 3, fig. 2. Recent, northern Red Sea, 512 meters.

—— *spinicostata* Cushman and Jarvis, 1929, var. *errata* nom. nov. Thalmann, Jour. Paleontology, vol. 23, p. 506. Lower Oligocene, Mexico. New name for: *Uvigerina spinicostata* Cushman and Jarvis, 1929, var. *acuminata* Thalmann, 1939 (non *Uvigerina acuminata* Hosius, 1893), Paläont. Zentralbl., vol. 13, p. 340.

—— *subfusiformis* Hussey, ibid., vol. 23, p. 132, pl. 27, fig. 1. Middle Eocene, Louisiana.

—— *taberana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 211, pl. 13, fig. 25. Middle Oligocene, Dominican Republic.

—— —— —— var. *baitoana* Bermudez, ibid., Spec. Pub. 25, p. 211, pl. 13, fig. 26. Middle Oligocene, Dominican Republic.

—— *toddae* Said, ibid., Spec. Pub. 26, p. 31, pl. 3, fig. 23. Recent, northern Red Sea, 80–433 meters.

—— *viaensis* Bermudez, ibid., Spec. Pub. 25, p. 212, pl. 13, fig. 20. Upper Oligocene, Dominican Republic.

—— *woodringi* Bermudez, ibid., Spec. Pub. 25, p. 212, pl. 13, fig. 10. Middle Oligocene, Dominican Republic.

—— —— —— var. *obsoleta* Bermudez, ibid., Spec. Pub. 25, p. 212, pl. 13, fig. 11. Middle Oligocene, Dominican Republic.

Uvigerinella subquadrata Hussey, Jour. Paleontology, vol. 23, p. 131, pl. 27, fig. 12. Middle Eocene, Louisiana.

Vaginulina pseudosenticosa Smith, Louisiana Geol. Survey Bull. 26 (1948, issued 1949), p. 59, pl. 12, fig. 12. Middle Miocene, Louisiana.

Valvulineria danvillensis (Howe and Wallace, 1932), var. *gyroidinoides* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 82, pl. 13, fig. 3. Eocene (Claibornian), Alabama.

—— *gasparensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 257, pl. 18, figs. 4–6. Upper Oligocene, Dominican Republic.

—— *gracilis* Hussey, Jour. Paleontology, vol. 23, p. 135, pl. 28, figs. 13, 14. Middle Eocene, Louisiana.

—— *haitiana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 257, pl. 18, figs. 1–3. Lower Eocene, Haiti.

—— *jacksonensis* Cushman, 1933, var. *persimilis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 83, pl. 13, fig. 4. Eocene (Claibornian), Alabama.

—— *suturalis* Cushman and Stone, Cushman Lab. Foram. Res. Contr. vol. 25, p. 55, pl. 10, figs. 10, 11. Middle Eocene, Peru.

Verneuilina hannai Smith, Louisiana Geol. Survey Bull. 26 (1948, published 1949), p. 55, pl. 11, figs. 10, 11. Middle Miocene, Louisiana.

—— *novina* Cita, Riv. Ital. di Paleont. e Strat., vol. 5, no. 4, p. 130, pl. 4, fig. 1. Upper Cretaceous (Campanian), northern Italy.

—— *nana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 67, pl. 3, figs. 7, 8. Upper Oligocene, Dominican Republic.

—— *polonica* Cushman and Glazewski, ibid., Contr., vol. 25, p. 7, pl. 1, figs. 14, 15. Upper Jurassic, Poland.

—— *yaquensis* Bermudez, ibid, Spec. Pub. 25, p. 68, pl. 3, figs. 9, 10. Upper Miocene, Dominican Republic.

VERNEUILINOIDES Loeblich and Tappan, Jour. Washington Acad. Sci., vol. 39, p. 91. New genus of the family Verneuilinidae. Genotype: *Verneuilina schizea* Cushman and Alexander, 1930. Cushman Lab. Foram. Res Contr., vol. 6, p. 9, pl. 2, figs. 13, 14. Jurassic, Cretaceous, Recent.

Virgulina dibollensis Cushman and Applin, 1926, var. *subtransversalis* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 137, pl. 26, fig. 10. Eocene (Claiborne), Alabama. For: *Virgulina dibollensis* Cushman, 1937 (non Cushman and Applin, 1926), Cushman Lab. Foram. Res. Spec. Publ. 9, p. 7, pl. 1, figs. 21, 22 (not fig. 20).

—— *diversa* Cushman and Stone, Cushman Lab. Foram. Res. Contr., vol. 25, p. 53, pl. 9, fig. 17. Middle Eocene, Peru.

—— *dominicana* Bermudez, ibid., Spec. Pub. 25, p. 186, pl. 12, fig. 17. Upper Oligocene, Dominican Republic.

—— *ishikiensis* Asano, Jour. Paleontology, vol. 23, p. 428, text-fig. 1, nos. 45, 46, 48, 56. Miocene, Japan.

—— *jurassica* Cushman and Glazewski, Cushman Lab. Foram. Res. Contr. vol. 25, p. 10, pl. 3, figs. 4, 5. Upper Jurassic, Poland.

—— *polymorphinoidea* Bandy, Bull. Am. Paleontology, vol. 32, no. 131, p. 137, pl. 26, fig. 13. Eocene (Claiborne), Alabama.

—— *regularis* Hussey, Jour. Paleontology, vol. 23, p. 134, pl. 27, fig. 11. Middle Eocene, Louisiana.

—— *spinulosa* Hussey, ibid., vol. 23, p. 134, pl. 27, fig. 8. Middle Eocene, Louisiana.

Vulvulina dermouti Boomgaart, Proefschr. (Thesis), Rijks-Univ. Utrecht, p. 53, pl. 3, fig. 9. Miocene, Java.

—— *dominicana* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 55, pl. 1, figs. 54–57. Middle Miocene, Dominican Republic.

—— *pennatula* (Batsch, 1791), var. *cuneata* Smith, Louisiana Geol. Survey Bull. 26 (1948, published 1949), p. 54, pl. 10, figs. 9–11. Middle Miocene, Louisiana.

Vulvulina (*?*) *vallensis* Bermudez, Cushman Lab. Foram. Res. Spec. Pub. 25, p. 56, pl. 1, figs. 72, 73. Middle Eocene, Dominican Republic.

Webbinella cretacea Hofker, Inst. Roy. Mus. Sci. Nat. Belgique, Mém. 112, p. 6, text-fig. 1. Upper Cretaceous (Maestrichtian), Holland.

FORMS WITH NOMENCLATURA APERTA

(The numbers in italic type refer to the publications in the preceding Bibliography for 1949.)

Allomorphina sp. (?) Cushman, *68*, p. 50, pl. 10, fig. 5. Recent, Belgium.

Amphicoryne sp. 1 Cuvillier and Szakall, *84*, p. 83, pl. 29, figs. 19, 20. Upper Oligocene, France.

Angulogerina sp. Muraour, *193a*, p. 114, pl. 5, figs. 64, 65. Pliocene, Algeria.

Articulina terquemi Cushman var. 1 Cuvillier and Szakall, *84*, p. 41, pl. 18, fig. 14. Upper Eocene, France.

Cancris sp. Bandy, *13*, p. 82, pl. 12, fig. 6. Upper Eocene, Alabama.

Cibicides sp. Asano, *8*, p. 478, text-fig. 2, no. 6. Upper Oligocene, Japan.

Clavulina species Boomgaart, *35*, p. 59, pl. 4, fig. 2. Pliocene, Java.

Clavulinoides sp. 1 Cuvillier and Szakall, *84*, p. 25, pl. 10, fig. 1. Lutetian, France.

—— sp. 2 Cuvillier and Szakall, *84*, p. 25, pl. 9, fig. 11. Lower Miocene, France.

Coscinoconus sp. Weiss, *342*, p. 305, microphoto 16. Jurassic, Switzerland.

Coskinolina sp. Cuvillier and Szakall, *84*, p. 35, pl. 15, fig. 15. Eocene, France.

—— (*?*) sp. Cuvillier and Szakall, *84*, p. 35, pl. 15, fig. 17. Cenomanian, France.

—— (*?*) sp. Cuvillier and Szakall, *84*, p. 35, pl. 15, fig. 18. Eocene, France.

—— (*?*) sp. Cuvillier and Szakall, *84*, p. 35, pl. 15, fig. 19. Eocene, France.

Cyclammina sp. 1 Cuvillier and Szakall, *84*, p. 10, pl. 2, fig. 12. Miocene, France.

—— sp. 2 Cuvillier and Szakall, *84*, p. 10, pl. 2, fig. 11. Cretaceous, France.

Darbyella (*?*) sp. Cuvillier and Szakall, *84*, p. 60, pl. 23, fig. 12. Eocene, France.

Dentalina sp. Asano, *7*, p. 426, text-fig. 1, no. 16. Miocene, Japan.

—— sp. Cushman and Cederstrom, *72*, p. 15, pl. 2, figs. 19, 20. Eocene, Virginia.

—— sp. Cushman and Glazewski, *73*, p. 10, pl. 3, fig. 3. Jurassic, Poland.

—— sp. Cushman and Stone, *77*, p. 79, pl. 14, fig. 4. Eocene, Peru.

—— sp. A Loeblich and Tappan, *171*, p. 257, pl. 49, fig. 8. Cretaceous, Oklahoma.

—— sp. B Loeblich and Tappan, *171*, p. 257, pl. 49, fig. 6. Cretaceous, Oklahoma.

—— *tenuicostata* Cushman and Bermudez var. 1 Cuvillier and Szakall, *84*, p. 76, pl. 28, fig. 27. Lutetian, France.

Dorothia sp. 1 Cuvillier and Szakall, *84*, p. 32, pl. 12, fig. 7. Cretaceous, France.

—— sp. 2 Cuvillier and Szakall, *84*, p. 32, pl. 15, fig. 3. Cretaceous, France.

—— sp. 3 Cuvillier and Szakall, *84*, p. 32, pl. 14, fig. 4. Cretaceous, France.

Eggerella sp. 1 Cuvillier and Szakall, *84*, p. 27, pl. 10, fig. 6. Miocene, France.

—— sp. 2 Cuvillier and Szakall, *84*, p. 27, pl. 10, fig. 7. Miocene, France.

? Ellipsoglandulina sp. Boomgaart, *35*, p. 123, pl. 9, fig. 8. Mio-Pliocene, Java.

Ellipsonodosaria sp. A Cushman, Stewart and Stewart, *74*, p. 134, pl. 15, fig. 10. Eocene, Oregon.

—— sp. B Cushman, Stewart and Stewart, *74*, p. 134, pl. 15, fig. 11. Eocene, Oregon.

—— sp. Cushman and Stone, *76*, p. 55, pl. 10, fig. 9. Eocene, Peru.

Elphidium sp. 1 Cuvillier and Szakall, *84*, p. 92, pl. 31, fig. 21. Eocene, France.

"*Endothyra*" sp. Thompson and Mellen, *318*, p. 52, pl. 5, fig. 20, Pennsylvanian, Mississippi.

Entosolenia species B Boomgaart, *35*, p. 109, pl. 8, fig. 24. Miocene, Java.

Eponides species Boomgaart, *35*, p. 128, pl. 14, fig. 3. Mio-Pliocene, Java.

Faujasina (*?*) sp. Asano, *8*, p. 476, text-fig. 2, no. 5. Oligocene, Japan.

Flabellina sp. 1 Cuvillier and Szakall, *84*, p. 84, pl. 30, fig. 16. Eocene, France.

—— sp. 2 Cuvillier and Szakall, *84*, p. 84, pl. 30, fig. 18. Cretaceous, France.

Frondicularia budensis Hantken var 1 Cuvillier and Szakall, *84*, p. 85, pl. 30, fig. 13. Cretaceous, France.

—— sp. Izgi (Tasman), *296*, p. 30, pl. 4, fig. 7. Miocene, Turkey.

—— *?* sp. 1 Cuvillier and Szakall, *84*, p. 85, pl. 30, fig. 6. Cretaceous, France.

—— sp. 2 Cuvillier and Szakall, *84*, p. 85, pl. 30, fig. 8, Eocene, France.

—— species A Boomgaart, *35*, p. 84, pl. 11, fig. 1. Pliocene, Java.

—— species B Boomgaart, *35*, p. 85, pl. 7, fig. 6. Plio-Miocene, Java.

Gaudryina species A Boomgaart, *35*, p. 54, pl. 4, fig. 3. Miocene, Java.

—— species B Boomgaart, *35*, p. 55, pl. 4, fig. 4. Miocene, Java.

? Gaudryina species C Boomgaart, *35*, p. 55, pl. 4, fig. 5. Mio-Pliocene, Java.

Gaudryina (*?*) sp. 1 Cuvillier and Szakall, *84*, p. 21, pl. 8, fig. 5. Eocene, France.

—— (*?*) sp. 2 Cuvillier and Szakall, *84*, p. 22, pl. 8, fig. 3. Eocene, France.

—— (*?*) sp. 3 Cuvillier and Szakall, *84*, p. 22, pl. 8, fig. 6. Eocene, France.

Glandulina (?) sp. (?) Cushman, *68*, p. 25, pl. 5, fig. 4. Recent, Belgium.
Guttulina sp. Bandy, *13*, p. 70, pl. 10, fig. 2. Eocene, Alabama.
—— sp. Loeblich and Tappan, *171*, p. 260, pl. 50, fig. 4. Cretaceous, Oklahoma.
Gyroidina (?) sp. (?) Cushman, *68*, p. 47, pl. 9, fig. 3. Recent, Belgium.
Haplophragmoides sp. Cushman, Stewart and Stewart, *74*, p. 129, pl. 14, fig. 1. Eocene, Oregon.
—— sp. 1 Cuvillier and Szakall, *84*, p. 8, pl. 1, fig. 5. Cretaceous, France.
—— sp. Boomgaart, *35*, p. 48, pl. 2, fig. 5. Mio-Pliocene, Java.
Karreriella, sp. 1 Cuvillier and Szakall, *94*, p. 33, pl. 13, fig. 1. Miocene, France.
Lenticulina sp. Loeblich and Tappan, *171*, p. 256, pl. 49, fig. 3. Cretaceous, Oklahoma.
Lingulina sp. Boomgaart, *35*, p. 83, pl. 7, fig. 13. Mio-Pliocene, Java.
Loxostoma sp. Boomgaart, *35*, p. 114, pl. 9, fig. 3. Miocene, Java.
Marginulina hauerina d'Orbigny var. 1. Cuvillier and Szakall, *84*, p. 67, pl. 25, fig. 34. Miocene, France.
—— sp. Loeblich and Tappan, *171*, p. 256, pl. 49, figs. 4, 5. Cretaceous, Okhaoma.
—— sp. 1 Cuvillier and Szakall, *84*, p. 64, pl. 25, fig. 10. Eocene, France.
—— sp. 2 Cuvillier and Szakall, *84*, p. 65, pl. 25, fig. 16. Eocene, France.
—— sp. 3 Cuvillier and Szakall, *84*, p. 71, pl. 26, fig. 8. Eocene, France.
—— sp. 4 Cuvillier and Szakall, *84*, p. 71, pl. 27, fig. 1. Cretaceous, France.
? Matanzia sp. Boomgaart, *35*, p. 60, pl. 5, figs. 1–3. Pliocene, Java.
Millerella ? n. sp. Thompson and Mellen, *318*, p. 52, pl. 5, fig. 9. Pennsylvanian, Wyoming.
Millettella sp. (?) Cushman, *68*, p. 6, pl. 1, fig. 1. Recent, Belgium.
Nautiloculina sp. Weiss, *342*, p. 304, microphoto 15. Jurassic, Switzerland.
Nodogenerina sp. Cushman and Stewart, *75*, p. 151, pl. 17, fig. 12. Pliocene, Washington.
Nodosaria aculeata d'Orbigny var. 1 Cuvillier and Szakall, *84*, p. 72, pl. 27, fig. 39. Miocene, France.
—— *?* sp. Bermudez, *30*, p. 149, pl. 9, fig. 66. Tertiary, Dominican Republic.
—— *?* sp. Cuvillier and Szakall, *84*, p. 75, pl. 27, fig. 33. Eocene, France.
—— sp. 2 Cuvillier and Szakall, *84*, p. 75, pl. 27, fig. 37. Eocene, France.
—— sp. Loeblich and Tappan, *171*, p. 258, pl. 49, fig. 13. Cretaceous, Oklahoma.
—— sp. Muraour, *193a*, p. 104, pl. 1, figs. 14, 15. Pliocene, Algeria.
Nonion sp. 1 Cuvillier and Szakall, *84*, p. 89, pl. 32, fig. 10, Miocene, France.
—— sp. 2 Cuvillier and Szakall, *84*, p. 89, pl. 32, fig. 8. Miocene, France.
—— *victoriense* Cushman, var. 1 Cuvillier and Szakall, *84*, p. 89, pl. 32, fig. 11.
Orbitolina discoidea Gras var. 1 Cuvillier and Szakall, *84*, p. 49, pl. 20, fig. 17. Cretaceous, France.
Parafusulina sp. A Thompson and Miller, *319*, p. 21, pl. 7, figs. 14, 17. Reworked. Venezuela.
—— sp. B Thompson and Miller, *319*, p. 22, pl. 7, figs. 13, 15. Reworked. Venezuela.
—— *?* sp. C Thompson and Miller, *319*, p. 22, pl. 7, fig. 16. Reworked. Venezuela.
—— *?* sp. D Thompson and Miller, *319*, p. 22, pl. 6, figs. 3–9. Reworked, Venezuela.
Planularia cooperensis Cushman var. 1 Cuvillier and Szakall, *84*, p. 60, pl. 24, fig. 2. Eocene, France.
—— sp. (?) Cushman, *68*, p. 21, pl. 4, fig. 5. Recent, Belgium.
—— sp. Cushman and Cederstrom, *72*, p. 11, pl. 2, figs. 1, 2. Eocene, Virginia.
—— sp. A Boomgaart, *35*, p. 76, pl. 6, fig. 14. Pliocene, Java.
—— sp. B Boomgaart, *35*, p. 76, pl. 6, fig. 15. Mio-Pliocene, Java.
Plectina (?) sp. 1 Cuvillier and Szakall, *84*, p. 33, pl. 10, fig. 9. Eocene, France.
Profusulinella ? sp. A Roberts, *258*, p. 185, pl. 36, figs. 5–9. Pennsylvanian, Peru.
Pseudoclavulina sp. 1 Cuvillier and Szakall, *84*, p. 23, pl. 9, fig. 1. Eocene, France.
—— sp. 2 Cuvillier and Szakall, *84*, p. 23, pl. 8, fig. 9. Cretaceous, France.
—— sp. 3 Cuvillier and Szakall, *84*, p. 23, pl. 9, fig. 4. Cretaceous, France.
—— sp. 4 Cuvillier and Szakall, *84*, p. 23, pl. 9, fig. 7. Cretaceous, France.
Pseudocyclammina sp. Weiss, *342*, p. 304, microphoto 9. Jurassic, Switzerland.
—— sp. Weiss, *342*, p. 304, microphoto 11. Jurassic, Switzerland.
—— sp. Weiss, *342*, p. 304, microphoto 14, Jurassic, Switzerland.
? —— sp. Weiss, *342*, p. 304, microphoto 10. Jurassic, Switzerland.
? Pseudofusulina sp. A Roberts, *258*, p. 233, pl. 40, figs. 9, 10. Permian, Peru.
Pseudoglandulina sp. Cushman and Cederstrom, *72*, p. 17, pl. 3, fig. 5. Eocene, Virginia.
Pulvinulinella sp. (?) Cushman, *68*, p. 48, pl. 9, fig. 7. Recent, Belgium.
Pyrgo sp. 1 Cuvillier and Szakall, *84*, p. 46, pl. 20, fig. 4. Tertiary, France.
Quinqueloculina lamarckiana d'Orbigny var. 1, Cuvillier and Szakall, *84*, p. 36, pl. 16, fig. 5. Miocene, France.
—— *longirostra* d'Orbigny var. 1 Cuvillier and Szakall, *84*, p. 39, pl. 16, fig. 4. Miocene, France.
—— sp. A Cushman and Glazewski, *73*, p. 9, pl. 2, figs. 12, 13. Jurassic, Poland.
—— sp. B Cushman and Glazewski, *73*, p. 9, pl. 2, figs. 14, 15. Jurassic, Poland.
—— sp. 1 Cuvillier and Szakall, *84*, p. 38, pl. 17, fig. 13. Miocene, France.
—— *triangularis* d'Orbigny var. 1 Cuvillier and Szakall, *84*, p. 38, pl. 17, fig. 5. Miocene, France.
Ramulina sp. Loeblich and Tappan, *171*, p. 262, pl. 50, figs. 7–9. Cretaceous, Oklahoma.

—— (*?*) sp. Cuvillier and Szakall, *84*, p. 87, pl. 31, fig. 5. Eocene, France.
Rectobolivina sp. Boomgaart, *35*, p. 116, pl. 9, fig. 6. Pliocene, Java.
Reophax ? sp. Cushman and Stone, *76*, p. 50, pl. 9, figs. 1, 2. Eocene, Peru.
Robulus brevispinosus Nuttall var. 1 Cuvillier and Szakall, *84*, p. 54, pl. 21, fig. 19. Miocene, France.
—— *calcar* (Linne) var. 1 Cuvillier and Szakall, *84*, p. 54, pl. 21, fig. 17. Miocene, France.
—— *calcar* (Linne) var. 2 Cuvillier and Szakall *84*, p. 54, pl. 21, fig. 14. Miocene, France.
—— *costatus* (Fichtel and Moll) var. A Boomgaart, *35*, p. 69, pl. 6, fig. 1. Pliocene, Java.
—— —— (——) var. B Boomgaart, *35*, p. 69, pl. 6, fig. 2. Mio-Pliocene, Java.
—— *incrustatus* Stache var. 1 Cuvillier and Szakall, *84*, p. 51, pl. 23, fig. 5. Eocene, France.
—— *papilloso-echinatus* Fornasini var. 1 Cuvillier and Szakall, *84*, p. 52, pl. 22, fig. 12. Eocene, France.
—— sp. Bermudez, *30*, p. 132, pl. 8, figs. 15, 16. Tertiary, Dominican Republic.
—— sp. Cushman and Glazewski, *73*, p. 9, pl. 2, fig. 16. Jurassic, Poland.
—— sp. 1 Cuvillier and Szakall, *84*, p. 52, pl. 22, fig. 20. Eocene, France.
—— sp. 2 Cuvillier and Szakall, *84*, p. 52, pl. 22, fig. 19. Miocene, France.
—— sp. 3 Cuvillier and Szakall, *84*, p. 52, pl. 22, fig. 13. Eocene, France.
—— sp. 4 Cuvillier and Szakall, *84*, p. 59, pl. 23, fig. 21. Miocene, France.
Robulus williamsoni Reuss var. 1 Cuvillier and Szakall, *84*, p. 55, pl. 22, fig. 29. Eocene, France.
Saracenaria sp. Cushman, Stewart and Stewart, *74*, p. 131, pl. 15, fig. 3. Eocene, Oregon.
—— (*?*) sp. Asano, *8*, p. 476, text fig. 1, no. 10, Oligocene, Japan.
Schwagerina sp. A Roberts, *258*, p. 216, pl. 38, figs. 14, 15. Permian, Peru.
—— sp. Thompson, *317*, p. 189, pl. 35, figs. 7, 8. Permian, Timor.
Sigmoidella (*?*) sp. Cuvillier and Szakall, *84*, p. 87, pl. 31, fig. 1. Miocene, France.
Spiroloculina grateloupi d'Orbigny var. 1. Cuvillier and Szakall, *84*, p. 39, pl. 18, fig. 2. Oligocene, France.
Staffella sp. Thompson and Miller, *319*, p. 9, pl. 7, figs. 8–12. Reworked. Venezuela.
Textularia ? sp. Cushman, Stewart and Stewart, *74*, p. 129, pl. 14, fig. 2. Eocene, Oregon.
—— sp. 1 Cuvillier and Szakall, *84*, p. 17, pl. 4, fig. 2. Eocene, France.
—— sp. 2 Cuvillier and Szakall, *84*, p. 17, pl. 6, fig. 2. Eocene, France.
—— sp. 3 Cuvillier and Szakall, *84*, p. 17, pl. 5, fig. 6. Eocene, France.
Textulariella sp. 1 Cuvillier and Szakall, *84*, p. 29, pl. 15, fig. 10. Tertiary, France.
Thurammina sp. Boomgaart, *35*, p. 43, pl. 1, fig. 3. Mio-Pliocene, Java.
? Trifarina sp. Boomgaart, *35*, p. 122, pl. 9, fig. 14. Mio-Pliocene, Java.
Triloculina sp. 1 Cuvillier and Szakall, *84*, p. 44, pl. 19, fig. 4. Miocene, France.
—— sp. Boomgaart, *35*, p. 66, pl. 5, fig. 14. Miocene, Java.
Tritaxilina sp. 1 Cuvillier and Szakall, *84*, p. 34, pl. 12, fig. 2. Eocene, France.
Triticites sp. A Roberts, *258*, p. 201, pl. 38, figs. 1, 2. Permo-Carboniferous, Peru.
—— sp. B Roberts, *258*, p. 202, pl. 38, fig. 3. Permian, Peru.
Trochammina sp. Said, *260*, p. 20, pl. 2, fig. 20. Recent, Red Sea.
—— sp. (*?*) Cushman, *68*, p. 20, pl. 4, fig. 2. Recent, Belgium.
—— sp. 1 Cuvillier and Szakall, *84*, p. 48, pl. 20, fig. 6. Cretaceous, France.
Uvigerina sp. Muraour, *193a*, p. 113, pl. 5, figs. 69, 70. Pliocene, Algeria.
Vaginulina sp. Izgi (Tasman), *296*, p. 30, pl. 4, fig. 6. Miocene, Turkey.
—— sp. 2 Cuvillier and Szakall, *84*, p. 82, pl. 29, fig. 14. Eocene, France.
—— sp. 3 Cuvillier and Szakall, *84*, p. 83, pl. 29, fig. 21. Miocene, France.
—— (*?*) sp. 1 Cuvillier and Szakall, *84*, p. 82, pl. 29, fig. 8. Eocene, France.
—— (*?*) sp. 4 Cuvillier and Szakall, *84*, p. 83, pl. 29, fig. 27. Eocene, France.
? Vaginulinopsis sp. Vasicek, *330*, p. 384, pl. 7, fig. 4. Neogene, Moravia.
? —— sp. Vasicek, *330*, p. 384, pl. 7, fig. 5. Neogene, Moravia.
? —— sp. Vasicek, *330*, p. 384, pl. 7, fig. 6. Neogene, Moravia.
? —— sp. Vasicek, *330*, p. 384, pl. 7, fig. 7. (copied after Brady).
Verneuilina sp. 1 Cuvillier and Szakall, *84*, p. 20, pl. 7, fig. 8. Eocene, France.
Verneuilinoides sp. Loeblich and Tappan, *171*, p. 255, pl. 48, fig. 8. Lower Cretaceous, Oklahoma.

NOMINA NUDA

The following nomina nuda were noted in the preceding Bibliography:

Brand, in Lit. No. *36*, cites on p. 348 from the Lower Cretaceous of northwestern Germany:

Ammovertella cellensis, n. sp.
Lenticulina, n. sp. aff. *complanata* (Reuss)
Parrina praeantiqua, n. sp.
Vaginulina riedeli, n. sp.
Discorbis valendisensis, n. sp.

and from the middle Jurassic (Dogger) of northwestern Germany:

Vaginulina infraopalina, n. sp.

Guzman, in Lit. No. *127*, cites on p. 1358 from the Oligocene of Mexico:

NUTTALLINA sp. (Note: there is no such genus amonst the Foraminifera)

Reichel, in Lit. No. *249*, introduces on p. 148, without adequate documentation, from the Oligo-Miocene of Cuba:

FUSARCHAIAS, gen. nov. (Family Peneroplidae)

with genotype: —— *bermudezi*, n. sp.

Wicher, in Lit. No. *344*, cites, without exact

description, or indication as to plate and figure, from the Upper Cretaceous (no country or locality given), the following forma nova:

Bolivinoides draco (Marsson, 1787) forma *gigantea*, n.f.

and

Flabellina reticulata Reuss, 1851, forma *daniensis*

(misprinted "*faniensis*" in text).

Salas, in Lit. No. *263*, cites on pp. 1394 and 1395, from the Eocene of Mexico the following manuscript names:

Cibicides tuxpamensis (Cole) var. *camitlaensis* (Ms.)

Hantkenina chicontepecensis (Nuttall) (Note: nonexistent species amongst the genus *Hantkenina*).

Lepidocyclina tuberculata (Ms).

Rectobolivina mexicana Cushm. var. *tenuistriata* Ms).

In order to validate these nomina nuda, the authors should publish them in a scientific journal in accordance with the International Rules of Zoological Nomenclature.

NOMENCLATURAL REMARKS

It should be pointed out that *Lagena laevis* Brady, 1884, Rept. Voyage Challenger, Zool., vol. 9, p. 455, pl. 54, figs. 10 and 11 (not figs. 7–9, 12–14, and 30) has been renamed *Lagena hispidula* Cushman, 1913, U. S. Nat. Mus. Bull. 71, pt. 3, p. 14, pl. 5, figs. 2, 3. Recent, Pacific, and, therefore, should not be included in the synonymy of *Lagena vulgaris* Williamson, 1858, var. *basispinata* Boomgaart, 1949, ut supra.

Siphonodosaria serrata Muraour, 1948, is again described as nov. spec. in Muraour, Lit. No. *193a*, p. 113, pl. 5, figs. 62–63, Lower Pliocene, Algeria, although it was duly described and figured by the same author in 1948 (see Jour. Paleontology, vol. 23, 1949, p. 660).

NEOFLABELLINA nom. nov. in Bartenstein, Lit. No. *21* of the preceding Bibliography, has been already published as such in Senckenbergiana, vol. 28, 1948, p. 122, footnote, and replaces *Flabellina* d'Orbigny, 1839 (non *Flabellina* F. S. Voigt, 1834, Mollusca).

INDEX TO FORAMINIFERA

SUPPLEMENT FOR 1933

Nummulites praefabiani Varentsov and Menner, Neft, geol-rzved. Inst. Inform. sborn. No. 2–3, p. 104, upper Eocene, Georgia, USSR. For: *Assilina aff. formai* Prever in Renngarten, 1931, Geol. Prosp. Serv. Trans., fasc. 24, p. 32, pl. 3, fig. 21; text-fig. 11.

SUPPLEMENT FOR 1937

Fusulina dutkevitchi Putrja, Azov-Black Sea Geol. Trust, Geol. and Min. Resources, Contr. (Materialy), vol. I, p. 68, pl. 2, fig. 18. Middle Carboniferous, Bolshoi-Donbas, USSR. (Note: The same species is redescribed and refigured by Putrja and Leontovich, in Lit. No. *473* of the preceding Bibliography, p. 43, pl. 4, figs. 4, 5 from the Middle Carboniferous of the Volga Valley.)

Fusulinella schubertellinoides Putrja, ibid., vol. 1, p. 54, pl. 1, fig. 7. Middle Carboniferous, Bolshoi-Donbas, USSR. (Note: This species is assigned to the genus *Profusulinella* by Putrja and Leontovich, 1948, see Lit. No. 473.)

SUPPLEMENT FOR 1939

Fusulina paratriangula Putrja, ibid., vol. 8, p. 186, pl. 1, fig. 16. Middle Carboniferous, Donetz Basin, USSR. (Note: Republished and refigured in Putrja and Leontovich, 1948, Lit. No. 473, p. 35, pl. 4, fig. 6, for forms from the Middle Carboniferous of the Volga Valley near Saratov.)

Fusulinella mira Semikhatova, Sci. Mem. Molotov-Univ., Rostov-on-Don, Trans., Chair Hist. Geol. and Paleont., p. 110, pl. 1, figs. 4, 5. Middle Carboniferous (Moscovian), Madveditsa area, Don Basin, USSR.

Triticites donensis Semikhatova, ibid., p. 119, pl. 2, figs. 23–25. Upper Carboniferous (Uralian), Don-Medveditsa region, USSR.

SUPPLEMENT FOR 1943

Astacolus sikoensis Ishizaki, Formosa Nat. Hist. Soc. Trans., vol. 33, p. 21, pl. 1, fig. 7. Pliocene, Formosa.

Ellipsonodosaria hayasakai Ishizaki, ibid., vol. 33, p. 683, text-fig. 2. Pliocene, Japan.

—— *hyugaensis* Ishizaki, ibid., vol. 33, p. 686, text-figs. 12, 13. Lower Pliocene, Japan.

—— *japonica* Ishizaki, ibid., vol. 33, p. 682, text-figs. 14, 15. Lower Pliocene, Japan.

—— *ketienziensis* Ishizaki, ibid., vol. 33, p. 684, text-figs. 1, 6, 11. Lower Pliocene, Japan.

—— *oinomikadoi* Ishizaki, ibid., vol. 33, p. 685, text-figs. 7–10. Lower Pliocene, Japan.

Lagenonodosaria nebulosa Ishizaki, ibid., vol. 33, p. 217, pl. 10, figs. 5, 7, 8. Pliocene, Taiwan.

Massilina kosyunensis Ishizaki, ibid., vol. 33, p. 20, pl. 1, fig. 2. Pliocene, Formosa.

Pyrgo tainanensis Ishizaki, ibid., vol. 33, p. 21, pl. 1, fig. 8. Pleistocene, Formosa.

Quinqueloculina makiyamai Ishizaki, ibid., vol. 33, p. 19, pl. 1, fig. 2. Lower Pliocene, Formosa.

Triloculina taiwanica Ishizaki, ibid., vol. 33, p. 20, pl. 1, fig. 1. Pliocene, Formosa.

Streblus yabei Ishizaki, Tawan Tigaku Kizi, vol. 14, nos. 3–4, December 1943, p. 53, pl. 2 (not pl. 1), figs. 2, 3. For: *Streblus*, n. sp. Ishizaki, 1940, Taiwan Tigaku Kizi, vol. 11, no. 2, p. 53, pl. 3, figs. 2–4, 11; pl. 4, figs. 11, 14–19; for: *Streblus* sp. Ishizaki, 1940, loc. cit., p. 55, pl. 3, figs. 7, 8; pl. 4, fig. 20; and for: *Rotalia* sp. Nakamura, 1942, Coll. of Essays, pl. 16, fig. 1.

—— *ketienziensis* Ishizaki, ibid., vol. 14, p. 59, pl. 1 (not pl. 2), fig. 5. Lower Pliocene, Formosa (Taiwan).

—— sp. Ishizaki, ibid., vol. 14, p. 52, pl. 1, fig. 8. No age given.

Vaginulina takaoensis Ishizaki, Formosa Nat. Hist. Soc. Trans., vol. 33, p. 22, pl. 1, figs. 3–6. Pliocene, Formosa.

SUPPLEMENT FOR 1944

Bolivina hotosakuensis Ishizaki, ibid., vol. 34, p. 101, pl. 3, fig. 5. Pliocene, Formosa (Taiwan).

—— *makiyamai* Ishizaki, ibid., vol. 34, p. 101, pl. 3, fig. 6. Pliocene, Formosa (Taiwan). For: *Bolivina* sp. nov. Ishizaki, 1940, Taiwan Tigaku Kizi, vol. 11, p. 19.

Dentalina hyugaensis Ishizaki, ibid., vol. 34, p. 100, pl. 3, fig. 2. Lower Pliocene, Formosa (Taiwan).

Gyroidina nipponica Ishizaki, ibid., vol. 34, p. 102, pl. 3, fig. 3. Pliocene, Formosa (Taiwan).

Textularia akaminei Ishizaki, ibid., vol. 34, p. 98, pl. 3, fig. 4. Middle Miocene, Formosa (Taiwan).

—— *hosonoi* Ishizaki, ibid., vol. 34, p. 99, pl. 3, fig. 1. Middle Miocene, Formosa (Taiwan). For: *Textularia ?* sp. Ishizaki, 1939, Taiwan Tigaku Kizi, vol. 10, no. 4, p. 111, pl. 8, fig. 3.

Valvulineria nipponica Ishizaki, ibid., vol. 34, p. 43, pl. 3, fig. 7. Lower Pliocene, Formosa (Taiwan).

SUPPLEMENT FOR 1945

The following species, until full documentary evidence is available, is regarded at the present time to be a nomen nudum:

Pseudofusulina concavutas Viss., cited in Keller, 1945, Bull. Soc. Natural. Moscou, n.s., vol. 50, sect. géol. vol. 20, nos. 5–6, Russian text, pp. 105 and 106. Permian, Karataou, Central Urals.

SUPPLEMENT FOR 1947

Bulimina schisckkinskye Samoilova, Soc. Natural. Moscou, Bull., n.s., vol. 52, sect. géol., vol. 22, no. 4, p. 82, text-fig. 10. Middle Oligocene, Crimea, USSR.

Cibicides acutus Samoilova, ibid., vol. 52, sect. geol., vol. 22, p. 97, text-figs. 40–42. Upper Eocene, Crimea, USSR.

—— *dutemplei* (d'Orbigny, 1846) var. *oligocenicus* Samoilova, ibid., vol. 52, sect. geol., vol. 22, p. 96, text-figs. 34–36. Lower Oligocene, Crimea, USSR. [NOTE: The varietal name is preoccupied by *Anomalina oligocaenica* Herrmann, (a *Cibicides*), 1917, Mitt. Geol. Landes-Anst. Elsass-Lothr., vol. 10, no. 3, p. 278, pl. 2, fig. 2.]

—— *pygmaeus* (Hantken, 1876) var. *almaensis* Samoilova, ibid., vol. 52, sect. geol., vol. 22, p. 94, text-figs. 31–33. Lower Oligocene, Crimea (NOTE: cave *Cibicides elmaensis* Rau, 1948).

Ellipsonodosaria volgensis Samoilova, ibid., vol. 52, sect. géol., vol. 22, p. 89, text-figs. 20, 21. Upper Eocene, Crimea, USSR.

Pulvinulinella almaensis Samoilova, ibid., vol. 52, sect. géol., vol. 22, p. 93, text-figs. 27, 28. Upper Eocene, Crimea, USSR. (NOTE: Should be allocated to the genus *Pseudoparrella*).

Species with *nomenclatura aperta:*

Nankinella sp. A. Dunbar and Misch, Geol. Soc. China Bull., vol. 27, p. 104 and 110, pl. 1, figs. 2, 3. Early Permian, Yunnan, China.

Pseudoschwagerina n. sp. Dunbar and Misch, ibid., vol. 27, p. 104 and 110, pl. 1, figs. 8, 9. Early Permian, Yunnan, China.

Rugofusulina (?) sp. Dunbar and Misch, ibid., vol. 27, pp. 104 and 110, pl. 1, figs. 10, 11. Early Permian, Yunnan, China. (NOTE: The correct spelling of the genus name is: *Rugosofusulina*, see Jour. Paleontology, vol. 23, no. 5, 1949, p. 506.)

Schubertella n. sp. Dunbar and Misch, ibid., vol. 27, p. 110, pl. 1, fig. 1. Early Permian, Yunnan, China. (NOTE: On p. 104 this species is determined as *Schubertella giraudi* Deprat.)

Staffella n. sp. Dunbar and Misch, ibid., vol. 27, p. 104, and 110, pl. 1, fig. 7. Early Permian, Yunnan, China.

SUPPLEMENT FOR 1948

Alveolina somaliensis Azzaroli, Soc. toscana sci. nat. Atti Mem. (A), vol. 55. Ypresian, Somaliland. (Publication not available to compiler.)

Anomalina hostaensis Morozova, Soc. Natural. Moscou, Bull., s.n., vol. 53, sect. géol., vol. 23, no. 2, p. 42, pl. 2, figs. 3–5. Lower Cretaceous, Caucasus, USSR.

Bulimina hostaensis Morozova, ibid., sect. géol., vol. 23, no. 2, p. 37, pl. 2, fig. 15. Lower Cretaceous, Caucasus, USSR.

Cassidulina vitalisi Majzon, Földt. Közlöny Magyar, vol. 78, p. 22, text-fig. 2. Rupelian, Hungary.

CAVIFERA Reitlinger, Moskov. obshch. ispyt. prir. Bull., otd. geol. vol. 23, no. 2, p. 80. New genus incertae sedis (probably Ammodiscidae), Genotype: *Cavifera concinna* Reitlinger, 1948, ut infra. Cambrian.

—— *concinna* Reitlinger, ibid., vol. 23, no. 2, p. 81, pl. 1, fig. 4. Cambrian, Yakutsk, USSR.

CENTENARIA Majzon, Földtany Közlöny Magyar., vol. 78, p. 24. New genus. Family not stated. (Lituolidae, subfam. Haplophragminae). Genotype: *Centenaria hungarica* Majzon, 1948, ut infra. Rupelian (Oligocene).

—— *hungarica* Majzon, ibid., vol. 78, p. 24, text-fig. 1. Oligocene Rupelian, Hungary.

Clavulina gaultina Morozova, Bull. Soc. Natural. Moscou, n.s., vol. 53, sect. géol., vol. 23, no. 3, p. 36, pl. 1, fig. 4. Lower Cretaceous, Caucasus, USSR.

Fusulina distenta Roth and Skinner, 1930, var. *ielschanica* Putrya and Leontovich, Moskov. obshch. ispyt. prir., Buill., otd. geol. vol. 23, no. 4, p. 37, pl. 3, fig. 5. Middle Carboniferous (Moscovian), Saratov, Volga region, USSR.

—— *pseudobocki* Putrya and Leontovich, ibid., vol. 23, no. 4, p. 42, pl. 4, figs. 7, 8. Middle Carboniferous (Moscovian), Saratov, Volga region, USSR.

—— *volgensis* Putrya and Leontovich, ibid., vol. 23, no. 4, p. 44, pl. 3, figs. 10, 11. Middle Carboniferous (Moscovian), Saratov, Volga region, USSR.

Globigerina gaultina Morozova, Bull. Soc. Natural. Moscou, n.s., vol. 53, sect. géol., vol. 23, no. 3, p. 41, pl. 2, figs. 16–18. Lower Cretaceous, Caucasus, USSR. For: *Globigerina cretacea* Chapman (non d'Orbigny), 1896,

Royal Micr. Soc. Jour., p. 588, pl. 13, figs. 5, 6.

GLOMOVERTELLA Reitlinger, Moskov. obshch. ispyt. prir. Bull., oft. geol., vol. 23, no. 2, p. 80. New genus incertae sedis (probably Ammodiscidae). Genotype: *Glomovertella firma* Reitlinger, 1948, ut infra. Cambrian.

—— *firma* Reitlinger, ibid., vol. 23, no. 2, p. 80, pl. 1, fig. 5. Cambrian, Yakutsk, USSR.

Gyroidina nitida (Reuss, 1844), var. *infracretacea* Morozova, Bull. Soc. Natural. Moscou, n.s., vol. 53, sect. géol., vol. 23, no. 3, p. 40, pl. 2, figs. 12–14. Lower Cretaceous, Caucasus, USSR.

Haplophragmoides chapmani nom. nov. Morozova, ibid., vol. 23, no. 3, p. 33, pl. 1, figs. 2, 3. Lower Cretaceous, Caucasus, USSR. New name for: *Haplophragmium latidorsatum* in: Chapman, 1892, Royal Micr. Soc. Jour., vol. 23, pl. 5, fig. 12; and in: Sherlock, 1914, Geol. Mag., vol. 1, n.s., no. 6, pl. 18, fig. 3. (NOTE: Species name preoccupied by Crespin, 1944, Royal Soc. New South Wales Proc., vol. 78, pl. 1, figs. 2, 3. Lower Cretaceous, Australia.)

Linderina bihilensis Silvestri, Palaeontogr. Italica, vol. 32, Suppl. 6, p. 19 (195), pl. 35, figs. 1–3. Middle Lutetian, Somaliland.

Miscellanea hedbergi de Cizancourt, Soc. géol. France Bull., ser. 5, vol. 18 (published September 1949), p. 669, pl. 23, figs. 1–3. Eocene, Nicaragua.

—— *nicaraguana* de Cizancourt, ibid., vol. 18, p. 668, pl. 23, figs. 5, 6, 8–11, 13. Eocene, Nicaragua.

OBRUCHEVELLA Reitlinger, Moskov. obshch. ispyt. prir. Bull., oft. geol., vol. 23, no. 2, p. 78. New genus incertae sedis (probably Ammodiscidae). Genotype: *Obruchevella delicata* Reitlinger, 1948, ut infra. Cambrian.

—— *delicata* Reitlinger, ibid., vol. 23, no. 2, p. 78, pl. 1, figs. 1, 2. Cambrian, Yakutsk, USSR.

—— —— —— var. *elongata* Reitlinger, ibid., vol. 23, no. 3, p. 80, pl. 1, fig. 3. Cambrian, Yakutsk, USSR.

Orthophragmina varians (Kaufmann, 1876), var. *obesa* Silvestri, Palaeontogr. Italica, vol. 32, Suppl. 6, p. 11 (187), pl. 32, fig. 4. Middle Eocene, Somaliland. For: *Orbitoides dispansa* (Sowerby) in: Carter, 1861, Annals and Mag. Nat. History (3), vol. 8, p. 449, pl. 16, fig. 1.

Ozawainella umbonata Putrya and Leontovich, Moskov. obshch. ispyt. prir. Bull., otf. geol., vol. 23, no. 4, p. 29, pl. 2, fig. 11. Middle Carboniferous (Moscovian), Saratov, Volga region, USSR.

Planularia antillea (Cushman, 1923) var. *ostraviensis* Vašiček, Casop. Vlast. Spolk. Mus. Olomouci, vol. 57, p. 2, text-figs. 1, 2. Tortonian (Miocene), Czechoslovakia.

Praealveolina cucumoides Silvestri, Palaeontogr. Italica, vol. 32, Suppl. 6, p. 73 (145), pl. 8 (16), fig. 6 (not pl. 9, fig. 6). Upper Cretaceous, Somaliland.

Profusulinella paraschubertellinoides Putrya and Leontovich, Moskov. obshch. ispyt. prir. Bull., otd. geol. vol. 23, no. 4, p. 28, pl. 2, figs. 4, 5. Middle Carboniferous (Moscovian), Saratov, Volga area, USSR.

—— *pseudorhomboides* Putrya, in: Putrya and Leontovich, ibid., vol. 23, no. 4, p. 24, pl. 1, fig. 10. Middle Carboniferous (Moscovian), Saratov, Volga region, USSR.

—— *saratovica* Putrya and Leontovich, ibid., vol. 23, no. 4, p. 21, pl. 1, figs. 13–14. Middle Carboniferous (Moscovian), Saratov, Volga region, USSR.

—— *skelnevatica* Putrya, in: Putrya and Leontovich, ibid., vol. 23, no. 4, p. 24, pl. 1, figs. 11, 12. Middle Carboniferous (Moscovian), Saratov, Volga region, USSR.

Schubertella paraobscura Putrya and Leontovich, ibid., vol. 23, no. 4, p. 16, pl. 1, figs. 2, 3. Middle Carboniferous (Moscovian), Saratov, Volga region, USSR.

—— *pseudomagna* Putrya and Leontovich, ibid., vol. 23, no. 4, p. 19, pl. 1, fig. 1. Middle Carboniferous (Moscovian), Saratov, Volga region, USSR.

Staffella umbilicata Putrya and Leontovich, ibid., vol. 23, no. 3, p. 30, pl. 2, figs. 12, 13. Lower Carboniferous, Volga region, USSR.

Streblus nakamurai Ishizaki, Acta Geol. Taiwanica, vol. 2, p. 62, pl. 1, fig. 4. Lower Pliocene, Japan.

—— *ketienziensis* Ishizaki, ibid., vol. 2, p. 59, pl. 1, fig. 2. Lower Pliocene Japan. [NOTE: Ishizaki has published another form under the same species name in 1943 (ut supra), which seems, however, to be different, and, moreover, comes from a type locality in Formosa (Taiwan). If further studies show that both forms are different, then the 1948-name becomes a homonym of the 1943-name.]

—— *sikokuensis* Ishizaki, ibid., vol. 2, p. 61, pl. 1, fig. 1. Lower Pliocene, Japan.

—— *takanabensis* Ishizaki, ibid., vol. 2, p. 57, pl. 1, fig. 5. Lower Pliocene, Japan.

—— *tosaensis* Ishizaki, ibid., vol. 2, p. 56, pl. 1, fig. 6. Lower Pliocene, Japan.

Sulcoperculina globosa de Cizancourt, Soc. géol. France Bull., ser. 5, vol. 18, 1948, published September 1949, p. 671, pl. 24, figs. 6, 7. Upper Cretaceous (Maestrichtian), eastern Venezuela.

—— *obesa* de Cizancourt, ibid., vol. 18, p. 671, pl. 24, figs. 11, 14. Upper Cretaceous (Maestrichtian), eastern Venezuela. (NOTE: Both new species of *Sulcoperculina* are, from a nomenclatural point of view, insufficiently described and, partly, erroneously referred to the figures of plate 24.)

SYNIELLA Reitlinger, Moskov. obshch. ispyt. prir. Bull., otf. geol., vol. 23, no. 2, p. 81. New genus incertae sedis. Genotype: *Syniella invenusta* Reitlinger, 1948, ut infra. Cambrian.

—— *invenusta* Reitlinger, ibid., vol. 23, no. 2, p. 81, pl. 1, fig. 6. Cambrian, Yakutsk, USSR.

Forms with *nomenclatura aperta:*

Dicyclina ? sp. Silvestri, Palaeontogr. Italica, vol. 32, Suppl. 6, p. 70, pl. 8, fig. 1; pl. 9, figs. 4, 6. Upper Cretaceous, Somaliland.

Loftusia sp. Silvestri, ibid., Suppl. 6, p. 79, pl. 8, 8, fig. 2. Upper Cretaceous, Somaliland.

Omphalocyclus sp. de Cizancourt, Soc. géol.

France Bull., vol. 18, p. 670, pl. 24, figs. 5, 8. Upper Cretaceous, Venezuela.

Sulcoperculina sp. nov. de Cizancourt, ibid., vol. 18, p. 674, pl. 24, figs. 11, 14. Upper Cretaceous, Venezuela.

NOMINA NUDA
Supplement for 1948

Putrya and Leontovich, in Lit. No. *473* of the preceding Bibliography, cite the following species, listed in table 1, p. 17, all of Moscovian age, which are here regarded as *nomina nuda* until full descriptions and illustrations are available:

Fusulina rasdorica Putr.

—— *triangula* Raus. and Bel. var. *rasdorica* Putr.

Pseudotriticites brazhnikovae Putr.

Ozawainella angulata Col. var. *leei* Putr.

—— *minima* Putr.

Staffella topilini Putr.

NOMENCLATURAL REMARK

Ishizaki, Lit. No. *459*, again publishes as a new species *Streblus yabei*, which seems to be identical with *S. yabei* Ishizaki 1943, ut supra, with the exception that the type of 1943 comes from Formosa (Taiwan) and not from Japan, as is the case with the species of 1948. The International Rules of Zoological Nomenclature strongly prohibit that a new species be published as such more than once. The same rule applies also to *Streblus ketienziensis* Ishizaki 1943 and 1948, ut supra, unless subsequent studies show clearly that different species are dealt with here.

JOURNAL OF PALEONTOLOGY, VOL. 24, NO. 6, PP. 746–748, NOVEMBER 1950

PALEONTOLOGIC CLASSIFICATION

CLAUD WILLIAM WRIGHT
London, England

I have read with the greatest interest Professor Weller's (1949) criticism of the habits of paleontologists in the fields of nomenclature and systematics, which appeared in a recent number of this journal. While agreeing with him in principle that a stable and practical classification is a most desirable aim for all paleontologists and other geologists, I feel that I must take issue with him on certain of the points he has raised. I disagree with him, however, more in emphasis than in substance.

PALEONTOLOGICAL AND BIOLOGICAL SPECIES

Professor Weller has, I think, made a false opposition here and his evidence does not really lead to the conclusions he draws. In the first place, it is surely not the case that to the biologist the conception of a species is still that of a population with certain characters. Surely today biologists have learned from the evidence of paleontology and of their own researches that they must conceive of species as extending through time and as part of an unbroken stream of life. The material with which the biologist deals consists, of course, of living populations just as the material of the paleontologist is the accumulation of chance relics of innumerable successive populations, but the conception which each has of species must be and is the same. Admittedly the expression of that concept in the diagnoses of species exhibits the different nature of the material, but that does not alter the fact that biologists and paleontologists are both dealing with the same categories of entities.

Without an effort of will it may be difficult for the paleontologist to bear in mind that each fossil represents a fragment of a population and for the biologist to remember that each population is only a fragment of a species. Perhaps the paleontologist, since he is forced to take account of time in all his thought, finds it easier than the biologist to attain to an adequate view of a species, but both must do so. Both naturally find it convenient to attempt to draw definite lines between species, genera and families but such lines obscure for both the realities of nature. The criterion that is fruitful for both is divergence in the course of time, entailing indefiniteness of the boundaries of a particular species or higher group wherever it is springing from or giving rise to another species or group. There are many cases in zoology and botany where difficulty of nomenclature arises because of indefiniteness of this type. There are, inevitably, far more cases in paleontology. Indeed, it is often of critical importance for correlation in stratigraphy that a certain fossil cannot definitely be assigned to one or the other of two successive species.

On the other hand, the basis on which species are diagnosed (as opposed to the way in which the concept of species in the abstract is defined or comprehended) surely remains essentially morphological, as much for the biologist as for the paleontologist. A biologist engaged in diagnosing a species should take account of all the factors affecting that form, its history in geological time, its embryology, its genetic constitution, its geographical distribution, its ecology, its physiology and so forth, but in the end, except in certain highly specialized groups with few morphological differences, he diagnoses his species with reference to morphological characters as does the paleontologist. Recent advance in the understanding of genetic and physiological constitution of species provides the biologist with means of understanding how mutation, acted on by geographical, ecological or physiological isolation and other factors, can have led to speciation but there is no reason why it should lead to the general replacement of the morphological basis of diagnosis.

STABILITY

It is difficult to produce concrete evidence for an opinion about the future stability of nomenclature, but I cannot help thinking that Professor Weller has been unduly, if naturally, pessimistic. The initial simplicity

of classification and nomenclature in the past was largely due to ignorance or lack of appreciation of the very real complexity of nature, and the field of the paleontologist is incomparably vaster than that of the biologist, concerned only with the population of one instant of geological time. The human mind is so constructed that it is hard for it to appreciate the variety, differences and interrelation of things unless those things are named and labeled in a way calculated to exhibit their variety, differences and interrelation; that, after all, is the fundamental reason for having classificatory nomenclature instead of casual and incoherent naming. It is consequently inevitable that increased appreciation of the differences between organisms should lead to an increase in the complexity of their nomenclature. It is likely, though not inevitable, that with greater understanding the nomenclature can be simplified. We can regard the first as the analytic, the second as the synthetic phase. A logician (Professor H. H. Price) has said, truly if sarcastically, that the chief result if not the purpose of philosophic study is to replace inarticulate certainty about things with articulate doubt. Ultimately, perhaps, that articulate doubt may be replaced by articulate certainty, but the earlier stage must be undergone first. The relevance of this conception of the mind's activity to systematics is obvious and though its results may be temporarily inconvenient they should not induce despondency about the outcome.

For example, in the particular field of Cretaceous ammonites, a field that often strikes paleontologists with horror, I believe that relationships between the various groups are simple and comprehensible, though by no means yet all understood, and that their classification will in time reveal that simplicity. The simplicity, however, is different from the primitive simplicity of a century ago, and is in sight now only as a result of the distinction, description and naming of vast numbers of species and their combination and recombination into genera. In fact, in this field we may now have passed through the analytic phase and be entering the synthetic. The same applies or will in time apply, I have little doubt, to most of paleontology.

MORPHOLOGY VERSUS PHYLOGENY

As indicated above, both the biologist and the paleontologist must diagnose their species and genera on the basis of morphological characters. Professor Weller pointed out that for practical reasons a limited number of features must be weighted in classification, since the majority of creatures have so many morphological characters that even with the fragmentary material that is alone available to the paleontologist there must be some selection. The important thing is the basis on which the characters for emphasis are selected. In the past, and probably in many cases today, the characters that have been selected are those that, in the group being investigated, happen to be the most prominent at first sight—characters of shape and gross ornament. The result has often been that unrelated groups have been combined, with disastrous effects on stratigraphy and correlation.

The real concern of the systematist is to find some method of selecting characters that avoids these serious results. The "phylogenetic approach" provides such a method, but it is, or should be, a means of selecting morphological characters for purposes of classification and not an approach to classification that is wholly opposed to a "morphological approach." Unless there is some guiding principle the selection of characters will be entirely arbitrary and it is difficult to see how a "frankly morphological" method could be other than arbitrary.

Professor Weller says that "only morphology can be observed and on its basis conclusions regarding phylogeny are drawn." This is, however, only partly true. The facts of chronological and geographical association or separation form a most important part of the evidence behind phylogenetic conclusions and such conclusions can be and sometimes (though by no means always!) are as valid as any of the inductive conclusions in biology.

Thus, to sum up, I would maintain, in opposition to Professor Weller, that a morphological classification, in which the morphological characters chosen for emphasis are selected on a phylogenetic basis, is not only less arbitrary than any other but is also likely to be more useful to the practical geologist.

Having emphazised the point of principle, I would add that in practice the principle should not rigidly be applied on a low level. It is clear that, strictly speaking, many genera are polyphyletic in the sense that their member species are derived from several roughly contemporary species of a single earlier genus, but that fact is of little systematic or practical importance. What the phylogenetic approach should enable the paleontologist to avoid is "high order polyphyly," that is, the lumping together in one genus of homeomorphic species of widely differing ages, derived from a number of quite distinct genera. If an attempt is made to maintain morphologic differences of the same scale between genera and attention is not paid to phylogeny, this high order polyphyly can often not be avoided. A phylogenetic approach draws attention to minor morphological differences by which the various stocks can be distinguished. Not to distinguish them, apart from all theoretical objections, deprives the stratigrapher of a useful tool.

PROLIFERATION OF GENERA AND NEW NAMES

Genera and subgenera are bound to proliferate in the analytic phase of the study of a group. They can be reduced again in number in the synthetic phase, by amalgamation or reduction of genera to the status of subgenera, if, but only if, it is shown that they do not represent sufficiently distinct groups. The reduction is, however, often only possible on a phylogenetic approach. The "frankly morphological" paleontologist might well decide to combine in one genus the Kimmeridgian ammonite genus *Gravesia* with the extremely similar Valanginian genus *Polyptychites*. The absence of similar forms in the intermediate rocks gives no reason to distinguish the two groups unless it is supported by a phylogenetic hypothesis.

It is wrong to condemn all proliferation of genera, just as it is wrong to condemn the phylogenetic approach in general. There is nothing sacred about the number of genera or of families in existence in a particular group on a given date. In fact, the classification of the different groups of animals is wildly out of step, in zoology as much as in paleontology. What is to be condemned wholeheartedly, and here I agree completely with Professor Weller, is the changing of names wholesale as part of a game of system-making, unrelated to the needs or the evidence of stratigraphers and working paleontologists. It is the responsibility of paleontologists to take account of all the relevant factors, stratigraphical, ontogenetic, phylogenetic etc., in their work, and to bear in mind the needs of their colleagues. The critic in his turn must examine each piece of work on its merits, a difficult task today with the vast increase of knowledge, so that he may distinguish justly between the good and bad paleontologist, and, perhaps more important, because failure to do so has more insidious effects, between the good and bad work of the same paleontologist; there are many cases of men who have made a subject their own and after a period of valuable analytic and systematic work have, as it were, been carried away by the momentum of their study to absurd lengths. This danger is not, however, avoided by sweeping condemnation of the methods and principles that are used in the valuable work as much as they are misused in the bad.

REFERENCE

WELLER, J. MARVIN, 1949, Paleontologic classification: Jour. Paleontology, vol. 23, pp. 680–690.

JOURNAL OF PALEONTOLOGY, VOL. 24, NO. 6, PP. 749–754, NOVEMBER 1950

NOMENCLATURAL NOTE

NOTES ON NOMENCLATURE, JULY, 1950

G. WINSTON SINCLAIR
University of Michigan, Ann Arbor

The International Commission on Zoological Nomenclature, meeting in Paris in 1948, agreed to rewrite their *Règles*, in order to remove verbal and grammatical infelicities, ambiguities and redundancies, and to incorporate in the *Règles* the principles which had been stated in *Opinions* of the Commission, and some principles which were agreed on for the first time in Paris. This new edition of the *Règles* has not yet appeared, but the Official Record of Proceedings of the Commission's meetings are now being issued. Since the *Règles* are being written to give effect to the Commission's decisions, these Proceedings should cover all the changes to appear in the *Règles*, although not necessarily in the same words.

A number of changes in the *Règles* are to take effect on January 1, 1951, and therefore it is essential that they be publicized as soon as possible. Hence this present discussion of the Proceedings which have appeared to date, as published in the Bulletin of Zoological Nomenclature, volume 4, parts 1–9 (in three brochures). This bulletin is on sale at the Publications Office of the International Trust for Zoological Nomenclature, 41 Queen's Gate, London, S.W. 7, at four pounds, eight shillings for the three brochures. The complete Proceedings will apparently run to six such brochures, at twice this price (a price which I suggest is exorbitant).

Although I review these Proceedings as part of the educational work of the Joint Committee on Zoological Nomenclature for Paleontology in America, it should be made clear that the opinions are my own, and do not reflect any official attitude of the Committee. It might be well to state here my personal attitude toward the work of the Commission in Paris. I regret that the procedure of the Commission was so contrary to the requirement of advance publicity, and I wish that things had been done differently. But work was done, and a new edition of the *Règles* is being issued. Without approving the methods, I am willing to examine the results without prejudice. If the rules are good, I will welcome them. If I think they are bad, I will work to have them changed. Having once stated disapproval of the Commission's methods, I see nothing to be gained by reiteration of my disapproval. Certainly I see no point in refusing to discuss the *Règles* on their own merits. The Commission is to meet in Copenhagen in 1953, and changes can be made. I doubt that the Commission will repeat the tactical errors which have been so loudly condemned.

Since the Proceedings are a journal record of discussion and decisions, they are not organized with reference to subject. The matters which I wish to discuss, or bring to the attention of American paleontologists, I have grouped under a few heads, but these do not appear in the Proceedings themselves. Since only one-half (approximately) of the proceedings has been published, it is possible that a few of the apparent conclusions were modified or reversed at later meetings of the Commission. There will be opportunity for further comment when the rest of the Proceedings become available.

DESIGNATION OF TYPE SPECIES OF GENERA

The codified *Règles* will include two points which have been more or less confused, but which now will be explicit. When an author designated a previously described species as the type species of a genus, he is to be assumed to have identified it correctly *in the absence of evidence to the contrary*. But in many of the disputed cases this evidence is clearly present, in the form of a specific description and illustrations. If such a type species has been, in the opinion of a worker, misidentified, the Commission invites an opportunity to rule that the type species is that which was evidently meant, and not

that which was named. This involves a retreat from objectivity, and the final effect will not be known until we see how the trend of rulings goes.

An author need not say in so many words "I designate this as the type species." It is enough that he say: "This is the type species, and I accept it as such," or words to that effect. Thus he may say: "This is the type species because Ulrich designated it," and this will stand, even though he was in error in thinking a prior designation existed.

Prior to 1931 designation of a type species in an indexing or abstracting serial is valid, even though based on an erroneous reading of the original paper.

The Commission has bowed to the wide use of the term *genotype* in genetics, and suggests that the phrase *type species* be used in nomenclature in its place.

TYPE OF SPECIES

The new *Règles* will define holotype, syntype and lectotype, in terms which are generally accepted. The problem of neotypes is to be studied further before any decision is reached. A set of rules for the determination and designation of type specimens is given, which accords well with most modern practice, except on one point.

It is ruled that an author may designate a specimen as holotype of a species (among other ways) by simply labelling it as such. This is contrary to the whole spirit of the *Règles*, that what is done privately cannot be binding on others, and I think the rule should be changed. As it stands, this ruling means that no state of syntypy can be presumed from the literature, but that the original specimens must be found and examined to see if one of them has been labelled "type." If one such specimen is found, then it is the holotype, even though this fact had never been published.

FORMATION OF NAMES

The Commission recommends that names be brief and euphonious, but declines to lay down any law governing permissive length, nor to define euphony, except to suggest that the names should be pronounceable in Latin. Besides these broad recommendations, some specific rules are enunciated.

Initial capitals are not to be used for trivial names. This ruling confirms our standard practice. Modern patronymics are not to be used in apposition. but are to be put in the genitive (by the addition of *-i*, *-ae*, *-orum*, or *-arum* to the name). But modern given names (prènoms) which are also classical names are to be declined as they would be in Greek or Latin.

The Commission has seen fit to rule on a class of names which I personally wish they had left alone. As it now stands, "a name which can reasonably be regarded, in any language, as calculated to give offense on political, religious or personal grounds is prohibited." This sounds harmless enough, and would be so were it a recommendation. But it is a definite rule, and names which contravene it are invalid. Now it is not required that the name be intentionally offensive, nor need the offense even be evident in the language of the author of the name. The ruling apparently arises out of two cases. The trivial name *britannicus* applied to an animal from Eire was felt to be politically offensive by a gentleman from that country, and so we have the first stipulation in the ruling. Surely this is most dangerous precedent: where can it not lead? With boundaries shifting as they have in the last generation, with national allegiances nominally shifting from year to year, the prospect is potentially appalling. How a scientific name can be religiously offensive I know not, and I suspect the Commission put the word in for the sake of symmetry. However, they may have had in mind such a slogan as *Nopoperyella*, or some such thing.

The possibility of personal offense is more subtle, and the potentialities more intriguing. The questions seem to have come up because some Brazilian scientists complained that a colleague was coining words which, while quite inoffensive in Latin, had scurrilous connotations in Portuguese. Unfortunately, the Commission, with a regrettably unscientific reticence, gives no examples. Presumably such (as yet) hypothetical genera as *Sinclairstinx*, *Castersascunque* or *Flowerrobdme* would qualify as prohibitable, but one can only guess. Is *Lapworthura* an offensive word? or *Foersteoceras?* Authors have held so, and have

often protested against such names, but with no suggestion that they were illegal.

Surely these are matters of taste, which call for no legislation. The Commission is more conservative in simply recommending that names which are bizarre, comic, or otherwise objectionable should be avoided. And here tastes will differ. Personally. I find *Eops eo* an irresistibly comic name for a trilobite, but I am very grateful to Dr. Richter for having made it.

GENDER OF GENERIC NAMES

Every worker is familiar with the confusion caused by the erection of generic names which are non-classical, and which have no inherent gender. If the original author combined with such generic names trivial names which were themselves noncommittal as to gender, then there was no certain way to decide how to construct later trivial names within the genus.

This confusion the Commission attempts to remove by including in the *Règles* rules for determining the gender of any word. If a name is Latin or Greek, or if the terminal portion of the name is Latin or Greek, then the name retains the gender which it would have in those languages. If the word is barbarous, and has an ending found in the nominative singular of the first or fifth declensions in Latin, then it is to be taken as feminine; if the ending be one found in the second, third or fourth declensions in Latin, then the word is to be taken as masculine. Any barbarous word whose ending is not found in one of the Latin declensions is to be taken as masculine. Put much more simply: any non-classical word ending in *-a*, *-e* or *-es* is to be regarded as feminine in gender; all others are to be regarded as masculine.

EMENDATION OF NAMES

This vexed matter of allowable, or obligatory, emendation of names is to be studied further, but ad interim the Commission has ruled that emendation is required where (a) a name based on a modern patronymic is misspelt, (b) where a Latinized word is incorrectly transcribed from the Greek, (c) where such a word is transcribed correctly, but the Greek word itself was misspelt, (d) where an error in transcription of a label has led to an incorrect geographic name and (e) where a name not Latin but adjectival in form has the termination *-ius* or *-ia*, these to be changed to *-eus* or *-ea*.

Emended names are to be cited as of the original author, and with the original date. Emendations, whether correct or not, preoccupy for purposes of homonymy, and an erroneous emendation is available as a junior synonym in case the original name is later rejected.

CONDITIONAL NAMES

The conclusion of *Opinion* 49 is to be incorporated in the *Règles*. I think it regrettable that when any statement about conditional names is being codified the whole question could not be examined and ruled on, for *Opinion* 49 dealt with only one type of case. That *Opinion* held that, if an author described an actual specimen, identifying it only doubtfully with a previously named species, and suggested a new name to be used in case the specimen proved to belong to an undescribed species, then that new name must stand, and date from the provisional publication.

To invent a case, if I describe a brachiopod under the heading *Rafinesquina alternata?* and then go on to say: "If this turns out to be new, I suggest it be called *R. canadensis*," then my name *R. canadensis* is validly published, and must be recognized by later workers. Thus say the *Règles*. But what if I omit the query in the heading, but include the same statement in my text? Or if I omit the query in the heading, but indicate in the text that I have not personally seen specimens of *R. alternata*, or otherwise make it clear that I have no sound grounds for my identification? The *Règles* gives no guidance on such possibilities. yet I think they are more common than the particular type of case covered in *Opinion* 49, and now to be included in the *Règles*.

There is, to be sure, the negative guidance offered by *Opinion* 118, which rules that if the erection of the new species is made contingent on the discovery of other specimens, then the name cannot stand, being held to be based on hypothetical material. There is still room for much confusion, and the best course would seem to be to refer each case to the Commission for

opinion, until we get opinions covering all types of conditional names.

SUBSPECIFIC NAMES

For names published before 1951, a trinomial (subgeneric names are not counted in determining the number of terms) is to be taken as referring to a subspecies unless the author definitely indicates that he regards the unit as infra-subspecific. That is, if the author calls it a subspecies, or if he does not particularize the category, then it is taken to be a subspecies. After 1950 this rule changes, so that the originally unassigned names are taken to be infra-subspecific, and only those names treated as subspecific which are definitely said to be so.

I do not find in this rule any clear instructions on the treatment of our ubiquitous paleontological "varieties." Possibly the rule in its final form will be more inclusive. At any rate, discussion on this point may be deferred.

WHAT IS PUBLICATION?

At last the Commission has grasped this particular nettle, and reached a number of decisions, some of which are of great importance.

The new *Règles* will state that material issued before 1951 is to be considered published if (a) it is reproduced by some mechanical method which insures that every copy is identical with every other copy, and (b) it is "a document issued for purpose of record and therefore of consultation by interested persons and must accordingly not be a document issued for exclusive consideration by special persons only, or only for particular purposes or for a limited time." I quote this section verbatim, since I have no idea what it means. Some of the things it might mean are frightening.

Let us consider a particular example. During the recent war there was great demand from oil geologists in western Canada for illustrations of guide fossils for early Mesozoic formations. To meet this demand the Geological Survey of Canada issued in their "Papers" series a number of reports written by Dr. F. H. McLearn, in which he described and illustrated faunules from important beds. This "Papers" series is preliminary in nature, affording a means of publishing needed information more promptly than can be done through the more formal and final Memoir or Bulletin series. In the case of the McLearn papers, the fossils were illustrated on hard paper, and the main text was mimeographed. Because of doubt as to the validity of mimeographing as a means of publishing new names, diagnosis of the species and genera concerned were given in printed form. Thus one of these papers consisted of (a) mimeographed sheets of text, descriptive of the formation, etc., (b) printed sheets with the description of new species and (c) printed sheets of figures of the fossils. The whole was unbound, and issued in an envelope. These papers were certainly issued for a "particular purpose," and from the point of view of the Survey "for a limited time." Yet they are available to the public, and have been distributed by the Survey to their exchange list. I would suggest that any rule making such work "not published" is a poor rule, and should be rewritten.

As it stands, it would seem that any serial called "Preliminary Papers," or "Preliminary Reports" would automatically be ruled out as being issued for a limited time.

What the Commission had in mind in writing "particular purposes" is not at all clear to me. Works which were clearly issued for "particular purposes" which come to mind include: guide-books for specific areas (e.g., Grabau's guides to the Niagara and Schoharie areas), museum guide-books (e.g., the various British Museum [Natural History] guides), programs of meetings (e.g., those issued by the British Association for the Advancement of Science), text books prepared for classroom use (e.g., Zittel), *Festbande* of one kind or another. All these might be considered to be issued for particular purposes, but their general availability and permanence of format do not depend on that fact, but on other considerations.

The *Règles* become more specific for material issued after 1950. A paper, to be considered published, must conform to the two requirements above, but also to others, of which the most important is that it be printed in ink on paper of "quality and durability sufficient to offer a reasonable prospect of permanency." Presumably any specific question whether a particular kind

of multigraphing or other process meets the requirement will be settled by decision of the Commission, on petition.

It is specifically held that the distribution of separata does not constitute publication. This point is so important in paleontology that a few comments may be in order. The rule is based on *Opinion* 59, but that *Opinion* itself is a most confused document. It is clear from the discussion in the *Opinion* that at least some of the Commissioners who voted that separates were not "published" were influenced by the fact that in the case before them the separates were marked "not for sale," and they held (erroneously) that offering for sale was essential for publication.

Let us take a hypothetical case. I write a ten-page paper dealing with a group of conularids. If I have it printed locally, distribute copies to those I know to be interested in the subject (some 12 people), and if I am willing to give a copy to anyone else who asks for it, then I have published this paper within the meaning of the *Règles*. But suppose I submit it to, say, the Geological Society of Glasgow, for publication in their Transactions. If the Society follows their usual practice they will print the paper and send me such copies as I may wish, but they will hold their sheets until enough have accumulated to make a volume, perhaps a matter of years, and then issue the whole. If now I distribute my copies as before, and keep a supply so that requests can be met, then the paper has not been published. If, however, these same copies are marked on the cover "Contribution from the Geology Department, University of Michigan," then they are considered to be published by the department. This is very confusing. Cases exist in which early distributed separates have been reviewed, and reviewed in such terms as to validate names, before the work has appeared in volume form.

This is a large question, and one not to be settled here. I think in considering it we should keep in mind the very limited public for which much of our work is done. Distribution of 100 copies of a paper to colleagues and to the Zoological Record and Biological Abstracts may well reach every interested person.

DATE OF PUBLICATION

A long, detailed rule is devoted to the point that the accepted date of publication must be the latest possible date consistent with the evidence. It is recommended that in citing a date, distinction be made between those cases where the date is on the title page; where the date is not on the title page but is otherwise determinable from the paper itself; and where the date can only be determined by reference to extraneous sources. These categories would be shown by citing the date as 1910, (1910) or [1910], respectively. This seems to me too clumsy for ordinary use, although it might be helpful in some types of technical bibliographic work.

HOMONYMS

The new *Règles* differ importantly from the old in their treatment of homonymy in trivial names. A primary homonym (i.e., a name which was a homonym when it was proposed) must be rejected. A secondary homonym (i.e., a name which was not a homonym when first proposed, but which became one through some change in generic assignment) need not be rejected unless the state of homonymy is considered to exist at present. But any secondary homonym which was rejected by an author before 1951 is to stand rejected. After 1950, rejection of a secondary homonym only stands if an author makes it clear that in his opinion the state of homonymy still exists. Rejected homonyms may not be used again. Rejected homonyms need not be replaced if there exists an available synonym, so long as that synonymy is held.

The rules of homonymy apply equally to subspecific names. That is, there cannot exist in one genus a species and a subspecies with the same trivial name (except in the case where the latter is the typical section of the former), nor two subspecies with the same trivial name, even though they may be considered sections of different species. Subgenera are not considered in assessing homonymy. There may not be two species with the same trivial name in one genus, even though they be considered as belonging to different subgenera.

To guard against wholesale capricious or malicious rejection of names as homonyms

(as would occur if a current author were to consider *Orthis* an inclusive genus, for example) the Commission draws specific attention to its plenary powers, which in such a case could be invoked to protect the current usage.

The definition of a homonym has been relaxed to remove the "same origin and meaning" clause, so that now a homonym may be recognized without recourse to esoteric knowledge of the source of the name.

The matter of homonymy in family names was discussed, but no decision was reached and there will be further study of the problem.

A number of European zoologists suggested that there should be a prescribed limit beyond which the law of homonymy should not operate, and 1850 was suggested as a suitable date. Thus, a name published before 1850 and now found to be a senior homonym of a currently accepted name would automatically be suppressed. The Commission did not accept this suggestion, but put it aside for further study. They did, however, make a suggestion which, if followed, would avoid much of our homonymic troubles. They recommend that an author who discovers an old senior homonym of a currently accepted name should at once refer the case to the Commission for decision and continue to use the current name, pending an opinion. This I consider most wise. If such an author publishes his discovery and rejects the junior homonym, the situation is unnecessarily confused, and the Commission's decision must be, not between a forgotten name and a current one, but between a current name and one now revived and republished. If the reviving author be an "authority," and if the time before an *Opinion* is rendered be long, so much the worse. The case of *Nummulites* vs. *Camerina* (*Opinion* 192) is most instructive.

FINAL REMARK

Many other matters are dealt with in the Proceedings, but those mentioned above are the ones which seem to me of greatest immediate interest. There will be occasion later for discussion of the formal *Règles*, when they are published.

JOURNAL OF PALEONTOLOGY

INDEX TO VOLUME 24

AUTHOR INDEX

		No.	Page
1.	ABBOTT, MAXINE L., Paleobotanical transfer method, A	5	619
2.	APPLIN, ESTHER R., and JORDAN, LOUISE, *"Lockhartia" cushmani* Applin and Jordan and notes on two previously described Foraminifera from Tertiary rocks in Florida	4	474
3.	ARKELL, W. J., Classification of the Jurassic ammonites, A	3	354
4.	ASANO, KIYOSHI, Check list of Tertiary smaller Foraminifera of Japan	3	307
5.	BANDY, ORVILLE L., Some later Cenozoic Foraminifera from Cape Blanco, Oregon	3	269
6.	BELL, W. C., Stratigraphy: a factor in paleontologic taxonomy	4	492
7.	VAN BELLEN, ROBERT C., Pitfall of paleontologic "Latin", A	4	504
	BISSELL, H. J., see THOMPSON, M. L. (87)		
8.	BLAKE, DANIEL B., Gosport Eocene Ostracoda from Little Stave Creek, Alabama	2	174
9.	VAN DEN BOLD, W. A., Checklist of Cuban Ostracoda, A	1	107
10.	VAN DEN BOLD, W. A., Miocene Ostracoda from Venezuela	1	76
11.	BRONNIMANN, P., Genus *Hantkenina* Cushman in Trinidad and Barbados, B. W. I., The	4	397
12.	BROWN, ROLAND W., Cretaceous fish egg capsule from Kansas	5	594
13.	BULMAN, O. M. B., Structure and relations of *Cyclograptus* Spencer, The	5	566
14.	BURSCH, J. G., Range chart as an aid in foraminiferal correlations, The	4	497
15.	CAUDRY, C. M. BRAMINE, Age of the Guaduas formation in Colombia; a correction, The	3	388
16.	CLINE, L. M., and HEUER, EDWARD, *Codaster alternatus-Codaster pyramidatus* group of blastoids from the Mid-Devonian of North America, The	2	154
17.	COLBERT, EDWIN D., Die Lebensweise der Dinosaurier, by Martin Wilfarth (Review of)	1	116
	COLLINSON, CHARLES, see MILLER, A. K. (55)		
18.	CRESPIN, IRENE, Australian Tertiary microfaunas and their relationships to assemblages elsewhere in the Pacific region	4	421
19.	CRICKMAY, C. H., Some Devonian Spiriferidae from Alberta	2	219
20.	CROFT, W. N., Parallel grinding instrument for the investigation of fossils by serial sections, A	6	693
21.	TEN DAM, A., Contributions to the knowledge of the young Caenozoic Ostracoda from the Malayan region, by J. Th. Kingma (Review of)	2	245
22.	TEN DAM, A., Foraminifères d'Aquitaine (Première partie: Reophacidae à Nonioninidae, by J. Cuvillier and V. Szakall (Review of)	2	246
23.	TEN DAM, A., Smaller Foraminifera from Bodjonegoro (Java), by L. Boomgaart (Review of)	2	245
24.	DODGE, HENRY, Suggested substitutes for the terms "lunule" and "escutcheon" in Pelecypoda	4	500
25.	DOWNS, H. R., and YOUNGQUIST, WALTER, Conodonts from the Cedar Valley limestone of Iowa	6	667
	DOWNS, H. R., see MILLER, A. K. (56, 57, 58), YOUNGQUIST, WALTER (99)		
	DUNCAN, DONALD, see LOCHMAN, CHRISTINA (49)		
26.	ELIAS, MAXIM K., *Fenestella deissi* (new name) from the Middle Devonian of Michigan, and related forms	3	390
27.	ELIAS, MAXIM K., Paleozoic *Ptychocladia* and related Foraminifera	3	287
28.	ELIAS, MAXIM K., State of paleontology, The	2	140
29.	EMILIANI, CESARE, Introduction to a method for determining the physical characters of fossil environments	4	485
30.	EMILIANI, CESARE, Ricerche stratigrafiche e micropaleontologiche sul Cretacio e sull'Eocene di Tignale (Lago di Garda), by Maria Bianca Cita (Review of)	4	512
	ENBYSK, BETTY B., see MCLAUGHLIN, KENNETH P. (52)		
31.	FAUL, HENRY, Fossil burrows from the Precambrian Ajibik quartzite of Michigan	1	102
32.	FLOWER, ROUSSEAU H., and KUMMEL, BERNHARD, JR., Classification of the Nautiloidea, A	5	604
33.	FRITZ, MADELEINE A., Multisolenida, a new order of the Schizocoralla	1	115

34. FRIZZELL, DON L., Examples of synonymous homonyms 1 117
35. GARRETT, J. B., JR., New name for a Texas Miocene foraminifer 4 506
36. GRAHAM, JOSEPH J., New Foraminifera from the type Meganos formation (Eocene) of California 3 282
37. HASS, OTTO, Ammonites: Tetrabranchiata or Dibranchiata? 1 109
38. HAAS, OTTO, Genus designation for species in evolutionary transition 5 625
39. HERPERS, HENRY, Onondagan faunule in New Jersey, An 5 617
HEUER, EDWARD, see CLINE, L. M. (16)
40. HIBBARD, CLAUDE W., and WILSON, JOHN A., New rodent from subsurface stratum in Bee County, Texas, A 5 621
41. HUSSEY, KEITH M., and MCNULTY, CHARLES L., JR., *Planularia planotrochiformis*, a new species showing variation in the genus 4 472
42. JELETZKY, JURIJ A., Some nomenclatorial and taxonomic problems in paleontology (With a discussion of the correlation of some uppermost Jurassic and Cretaceous faunas on both sides of the Atlantic) 1 19
43. JOHNSON, J. HARLAN, Permian algal-foraminiferal consortium from West Texas, A 1 61
JORDAN, LOUISE, see APPLIN, ESTHER R. (2)
44. KEEN, A. MYRA, Paläontologische *Zeitschrift* 5 635
45. KJELLESVIG-WAERING, ERIK N., New Silurian eurypterid from Florida, A 2 229
46. KJELLESVIG-WAERING, ERIK N., New Silurian Hughmilleria from West Virginia, A 2 226
KUMMEL, BERNHARD, JR., see FLOWER, ROUSSEAU H. (32)
47. LEVINSON, STUART A., Hingement of Paleozoic Ostracoda and its bearing on orientation, The 1 63
48. LOCHMAN, CHRISTINA, Upper Cambrian faunas of the Little Rocky Mountains, Montana 3 322
49. LOCHMAN, CHRISTINA, and DUNCAN, DONALD, Lower Ordovician *Bellefontia* fauna in central Montana, The 3 350
50. LOEBLICH, ALFRED R., JR., and TAPPAN, HELEN, North American Jurassic Foraminifera: I. The type Redwater shale (Oxfordian) of South Dakota 1 39
51. MACDONALD, J. R., New species of *Nimravus* from the upper Oligocene of South Dakota, A 5 601
52. MCLAUGHLIN, KENNETH P., and ENBYSK, BETTY B., Middle Cambrian trilobites from Pend Oreille County, Washington 4 466
MCNULTY, CHARLES L., JR., see HUSSEY, KEITH M. (41)
53. MILLER, A. K., *Brittsoceras*, a synonym of *Porcellia* 4 506
54. MILLER, A. K., Role of Paleozoic ammonoids in pure and applied geology, The (abstract) 2 130
55. MILLER, A. K., and COLLINSON, CHARLES, Unique Mississippian nautiloid from Kentucky, A 6 673
56. MILLER, A. K., and DOWNS, H. R., Additional ammonoids from the Mississippian Barnett formation of Texas 5 575
57. MILLER, A K., and DOWNS, H. R., Ammonoids of the Pennsylvanian Finis shale of Texas 2 185
58. MILLER, A. K., and DOWNS, H. R., Tertiary nautiloids of the Americas: supplement 1 1
MILLER, A K., see YOUNGQUIST, WALTER (99)
59. MOORE, RAYMOND C., New Japanese paleontological journal 5 635
60. NAKKADY, S. E., New foraminiferal fauna from the Esna shales and Upper Cretaceous Chalk of Egypt, A 6 675
61. NICOL, DAVID, Origin of the pelecypod family Glycymeridae 1 89
62. OKULITCH, VLADIMIR J., *Monocyathus* Bedford versus *Archaeolynthus* Taylor ... 4 502
63. OKULITCH, VLADIMIR J., Nomenclatural notes on pleosponge genera *Archaeocyathus, Spirocyathus, Flindersicyathus, Pycnoidocyathus* and *Cambrocyathus* 3 393
64. OKULITCH, VLADIMIR J., *Pluralicyathus*, new name for *Polycyathus* Vologdin, 1928 not Duncan, 1876 ..... 4 503
65. OKULITCH, VLADIMIR J., Structure of the body of the regular Archaeocyathi, The (On the basis of a study of *Archaeocyathus demboi*, sp. nov.), by A. G. Vologdin (Review of) 4 513
66. OKULITCH, VLADIMIR J., *Vacuocyathus*, a new name for *Coelocyathus* Vologdin, 1933 3 392
67. REIMANN, IRVING G., Possible phylogenetic relationships of some early eublastoids 4 499
68. SCHEMEL, MART P., Carboniferous plant spores from Daggett County, Utah 2 232
69. SCHEVILL, WILLIAM E., *Münsterella*, new name for *Kelaeno* Munster 1842, non Münster 1839 ..... 1 117
70. SCHEVILL, WILLIAM E., Upper Jurassic sepoid from Cuba, An 1 99
71. SHAW, ALAN B., Paleogeography and nomenclature—another commentary 1 110
72. SHAW, ALAN B., Revision of several early Cambrian trilobites from eastern Massachusetts, A 5 577

73. SHAW, ALAN B., and STUBBLEFIELD, C. J., *Trinucleus* Murchison, 1839 as a nomen conservandum 5 624
74. SIMPSON, GEORGE GAYLORD, Trends in research and the Journal of Paleontology... 4 498
75. SINCLAIR, G. WINSTON, Notes on nomenclature, July, 1950 ..... 6 749
76. SLOSS, L. L., Rates of evolution 2 131
77. STAINBROOK, MERRILL A., Brachiopods and stratigraphy of the Aplington formation of northern Iowa 3 365
78. STAINFORTH, R. M., Comments on "A pitfall of paleontologic 'Latin'" 4 504
79. STAINFORTH, R. M., Types of *Pullenia duplicata* Stainforth 4 502
80. STEWART, GRACE ANN., Ostracoda from Middle Devonian Bone beds in central Ohio 6 652
81. STRIMPLE, HARRELL L., Emendation of *Endelocrinus tumidus* (Strimple) 1 112
82. STRIMPLE, HARRELL L., New species of *Uthacrinus* and *Lasanocrinus* 5 571
STUBBLEFIELD, C J., see SHAW, ALAN B. (73)
83. STUMM, ERWIN C., New name for *Favosites proximus* Davis 3 395
TAPPAN, HELEN, see LOEBLICH, ALFRED R., JR., (50)
84. TEICHERT, CURT, Paléontologie marocaine I. Généralités sur les invertebrés fossiles, by Geneviève Termier and Henri Termier (Review of) 4 515
85. THALMANN, HANS E., Bibliography and index to new genera, species and varieties of Foraminifera for the year 1949 ..... 6 699
86. THOMAS, LEO A., Sweetland Creek (Devonian) conodonts 4 497
87. THOMPSON, M. L., VERVILLE, G. J., and BISSELL, H. J., Pennsylvanian fusulinids of the south-central Wasatch Mountains, Utah 4 430
88. UMBGROVE, J. H. F., Corals from the Putjangan beds (lower Pleistocene) of Java 6 637
VERVILLE, G. J., see THOMPSON, M. L. (87)
89. WELLER, J. MARVIN, Ist eine unveränderliche Form des Art-Namens möglich? (Is an unchanging form of species names possible?), by Rudolf Richter (Review of) 4 507
90. WELLER, J. MARVIN, Meaning of evolution, a study of the history of life and of its significance for men, The, by George Gaylord Simpson (Review of) 2 247
91. WHITE, M. P., Fusulinid slide rule, A 2 123
92. WHITTINGTON, HARRY B., Sixteen Ordovician genotype trilobites 5 531
93. WILSON, JAMES LEE, Upper Cambrian pleospongid(?), An 5 591
94. WILSON, JOHN ANDREW, Cope's types of fossil reptiles in the collection of the Bureau of Economic Geology, The University of Texas 1 113
95. WILSON, JOHN ANDREW, Platysomid from the Double Mountain group of Texas, A 3 386
WILSON, JOHN ANDREW, see HIBBARD, CLAUDE W. (40)
96. WRIGHT, CLAUD WILLIAM, Comment on proposal to substitute *prosopon* for ornament 4 497
97. WRIGHT, CLAUD WILLIAM, Illegitimate "corrections" of orthography of generic names 4 506
98. WRIGHT, CLAUD WILLIAM, Paleontologic classification 6 746
99. YOUNGQUIST, WALTER, MILLER, A. K., and DOWNS, H. R., Burlington conodonts from Iowa 5 525
YOUNGQUIST, WALTER, see DOWNS, H. R. (25)
100. ANONYMOUS, Publication of second installment of cards on the corals, part of the Illustrated Catalogue of North American Devonian Fossils 1 119
101. ANONYMOUS, Symposium and round-table conference on fundamentals in paleontology at the St. Louis meeting of the S. E. P. M. in 1949: Introduction 2 121

SUBJECT INDEX

Ajibik quartzite (Huronian): fossil burrows, Michigan (31).
Alabama: Ostracoda, n. gen., n. sp., Claiborne Eocene (8).
Alberta: Spiriferidae, n. gen., n. sp., Devonian (19).
Algae: algal-foraminiferal consortium, Permian, Texas (43).
Ammonoidea: Paleozoic, role in geology (54); Texas, Mississippian (56), Pennsylvanian (51); ammonites, classification (3, 37).
Aplington formation (Lower Mississippian): age, Brachiopoda, n. sp., stratigraphy (77).
Archaeolynthus Taylor versus *Monocyathus* Bedford (62).
Archimedes (28).
Austral-Indo-Pacific province: Teritary, Australia and Tasmania (18).
Australia: Tertiary, correlation, Foraminifera, major sedimentary provinces (18).
Baja California: *Hercoglossa,* Paleocene (58).
Barbados: *Hantkenina,* Eocene (11).
Barnett formation (Mississippian): ammonoids, Texas (56).
Bass Strait province: Tertiary, Australia and Tasmania (18).
Bellefontia fauna: Lower Ordovician, central Montana (49).

Bibliography: Foraminifera, new genera, species and varieties, 1949; supplements for 1933, 1936, 1937-1948 (85).
biological change: relationship to physical change (76).
Blastoidea: mid-Devonian, North America (16); eublastoids, early, phylogenetic relations (67).
Bone beds (Middle Devonian): Ostracoda, Ohio (80).
Brachiopoda: Lower Mississippian, Iowa (77); Devonian, Alberta (19).
British Columbia: Middle Cambrian, correlation with Washington (52).
British West Indes: *Hantkenina,* Eocene (11).
Brittsoceras: synonym of *Porcellia* (53).
Bryozoa: *Fenestella deissi,* Middle Devonian, Michigan, *F. serratula,* Upper Mississippian and Lower Pennsylvanian, Illinois, *F. serratula* var. *nekhoroshevi,* Lower Carboniferous, Russia (26); *Ptychocladia* as foraminifer (27).
Burgess shale (Middle Cambrian): correlation with Metaline limestone, Washington (52).
Burlington limestone (Mississippian): conodonts, Iowa (99).
burrows, fossil: Ajibik quartzite (Huronian), Michigan (31).
California: *Aturia,* Eocene, Miocene (58); *Eutrephoceras,* Paleocene (58); Foraminifera, n. sp., Eocene (36).
Cambrian: early, Trilobita, revision, Massachusetts (72); Lower or Middle, *Chabakovia,* Urals, as foraminifer (27); Middle, Trilobita, Washington (52), *Vacuocyathus,* Russia (66); Upper, faunas, measured section, Montana (48), pleospongid-type organism, Texas (93).
Canada: graptolites, Middle Silurian (13); Middle Cambrian, correlation with Washington (52); Multisolenida, new order of Schizocoralla (33); Spiriferidae, Devonian (19).
Carboniferous: plant spores, Utah, and comparison to British, Polish and Russian (68); Lower, *Fenestella serratula* var. *nekhoroshevi,* Kuznetsk Basin (26).
carbonized compressions: method of stripping from shale or clay (1).
Cedar Valley limestone: conodonts, correlation with Middle Devonian, Iowa (25).
Cenozoic: Foraminifera, n. sp., n. var., lithology and significant fossils, Oregon (5).
Cephalopoda: ammonoids, Mississippian, Texas (56), Paleozoic, role in geology (54), Pennsylvanian, Texas (57); ammonites, Jurassic, classification (3); *Brittsoceras* (53); *Münsterella* (69); Nautiloidea, classification (32), *Tylodiscoceras unicum,* Mississippian, Kentucky (55); sepioid, upper Jurassic, Cuba (70).
Chabakovia: Middle or Lower Cambrian, Urals, oldest known foraminifer (27).
check lists: Foraminifera, smaller Tertiary, Japan (4); Ostracoda, Cuba (9).
Claiborne (Eocene): Ostracoda, n. gen., n. sp., Alabama (8).
Codaster: several species referred to *Pleuroschisma* (67); *C. pyramidatus* (16).
Colombia: *Cimomia,* Paleocene (58); Guaduas formation (Tertiary), age correction (15).
Columbus limestone (Middle Devonian): *Euglyphella spinosa,* n. sp., Ohio (80).
conodonts: Iowa, Devanian (86), Middle Devonian (25), Mississippian (99).
Cope, E. D.: fossil reptile collection, synonymies and numbers, University of Texas (94).
corals: lower Pleistocene, Java (88); Illustrated Catalogue of North American Devonian fossils (100 and no. 5, p. 635); *Favosites proximatus* (83); Multisolenida, new order (33).
Cretaceous: correlation (42), origin of Glycymeridae (61), *Planularia planotrochiformis,* n. sp., Texas (41); Upper, fish egg capsule, Kansas (12), Foraminifera, Egypt (60), Ostracoda, checklist, Cuba (9).
Crinoidea: *Endelocrinus tumidus,* emendation (81); Pennsylvanian, n. sp., Kansas (82).
Cuba: *Aturia,* Miocene (58); Ostracoda, checklist (9); sepioid, upper Jurassic (70).
Cyclograptus: in Idiotubidae; redescription of *C. rotadentatus* (13).
decamicron: new unit of measure (29).
Delaware formation (Middle Devonian): Ostracoda, Ohio (80).
Desmoinesian stage (Pennsylvanian): Crinoidea, Oklahoma (82); fusulinids, Utah (87).
Devonian: conodonts, Iowa (86), corals, Illustrated Catalogue of North American Devonian fossils (100 and no. 5, p. 635); Lower, eublastoids (67); Middle, Blastoidea, North America (16), conodonts, Iowa (25), faunule, New Jersey (39), *Fenestella deissi,* Michigan (26), Ostracoda, Ohio (80); Middle and early Upper, Spiriferidae, Alberta (19).
Double Mountain group (Permian): platysomid, Texas (95).
egg, fish: Upper Cretaceous, Kansas, youngest spirally twisted (12).
Egypt: Foraminifera, n. sp., lower Eocene and Upper Cretaceous (60).
Elk River beds (Pleistocene): correlation with terrace beds, Cape Blanco, Oregon (5).
Endelocrinus tumidus (Strimple): emendation (81).
environments, fossil: method for determining physical characters of (29).
Eocene: nautiloids, California, Texas, Washington, Peru (58), Ostracoda, Alabama (8), checklist, Cuba (9); lower, Foraminifera, n. sp. Egypt (60).
eodiscids: early Cambrian, Massachusetts (72).
errata: no. 1, p. 120; no. 3, p. 396.

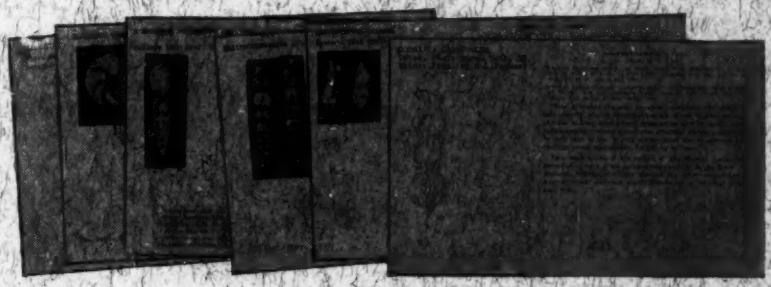
escutcheon: suggested replacement of term by *vallis* (24).
Esna shales (lower Eocene): Foraminifera, n. sp., Egypt (60).
Esopus formation (Middle Devonian): faunule, correlation with Onondagan, New Jersey (39).
Eublastoidea: early, possible phylogenetic relationships (67).
eurypterids: new, Silurian, West Virginia (46); n. sp., Upper Silurian, Florida (45).
evolution: laws of (91); principal working hypotheses (28); rates of (76); evolutionary transition, genus designation for species in (38).
extinction, rates of (76).
faunas: horizons of change in, recognition of, relative significance in stratigraphy (14); succession of, laws (6); technically difficult, neglect of (28).
Favositidae: Illustrated Catalogue of North American Devonian fossils (100 and no. 5, p. 635).
Felidae: *Nimravus altidens,* n. sp., upper Oligocene, South Dakota (51).
Fenestella: Middle Devonian, *F. deissi,* new name for *F. foraminosa,* ancestor of *F. serratula* (26); *F. serratula* var. *nekhoroshevi,* Lower Carboniferous, Russia (26).
Finis shale (Upper Pennsylvania): ammonoids, Texas (57).
fish: egg capsule, shark-like, Upper Cretaceous, Kansas (12); platysomid, Permian, Texas (95).
Florida: *Aturia,* Miocene (58); eurypterid, Middle Silurian (45); Foraminifera, Tertiary (2).
Foraminifera: algal-foraminiferal consortium, Permian, Texas (43); bibliography and index, new genera, species and varieties, 1949, and supplements, 1933, 1936, 1937-1948 (85); *Chabakovia,* Middle or Lower Cambrian, Urals (27); Cretaceous, Upper, Egypt (60); Eocene, California (36), Trinidad and Barbados (11), lower, Egypt (60); *Elphidium leonensis,* Tertiary, Florida, comparison with *E. rota* (2); fusulinids, development and evolution (91), *Fusulina,* Pennsylvanian, Utah (87), slide rule (91), various, Pennsylvanian, Utah (87); *Hantkenina,* stratigraphic significance, n. subgen., n. sp., Eocene, Trinidad and Barbados (11); homonyms (85); Jurassic, South Dakota (50); Lagenidae, Jurassic, South Dakota (50); *Lockhartia,* comparison with *"L." cushmani* (2); *"Lockhartia" cushmani,* Tertiary, Florida, internal characters, comparison with *L.* and with geno-lectotype of Rotalia (2); *Miscellanea nassauensis,* Tertiary, Florida, generic placement (2); nomenclatural remarks (85); nomina nuda (85); oldest known, Middle or Lower Cambrian, Urals (27); Permian, Lower, Russia (27); *Planularia palmerana,* Miocene, Texas (35), *P. planotrochiformis,* Cretaceous, Texas (41); Pleistocene and Pliocene, Oregon (5); *Pullenia duplicata,* types (79); *Ptychocladia,* life cycle, structure, megalospheric generation, Pennsylvanian, Kansas, Nebraska, Oklahoma, Pennsylvania (27); Ptychocladiidae, Paleozoic, new family, adnate, evolution and ecology (27); range chart as aid in correlation (14); *Rotalia trochidiformis,* comparison with *"Lockhartia" cushmani* (2); Tertiary, Australia, Tasmania (18), small, checklist, Japan (4); used to determine physical character of fossil environment (29).
fusulinids: development and evolution (91); Pennsylvanian, Utah (87); slide rule (91).
Gastropoda: *Brittsoceras,* synonym of *Porcellia* (53).
gender: generic names (75, 89); specific names (89); varietal names (7).
genera: ammonites (3); inception (28); names, corrections of orthography (97), gender (75, 89), new (98); species in evolutionary transition (38); proliferation (98); time ranges and stratigraphic boundaries (28); types, designation (75); varations (41).
Germany: *Münsterella* (69); *Pullenia duplicata,* types, Oligocene (79).
Glycymeridae: origin of from cucullaeid stock, late Jurassic (61).
Gosport sand (Eocene): Ostracoda, n. gen., n. sp., Alabama (8).
Graham formation (Upper Pennsylvania): ammonoids, Texas (57).
graptolites: dendroid, Silurian, Ontario (13).
Great Britain: plant spores, Carboniferous, compared with those from Utah (68).
grinding instrument for serial sections (20).
Guaduas formation (Tertiary): correction of age, Colombia (15).
Hantkenina: description, stratigraphic significance, Eocene, Trinidad and Barbados (11).
hingement: Ostracoda, Paleozoic (47).
homonyms: (75). Foraminifera, 1949, unchanged (85); synonymous, examples (34).
Hoppin slate (early Cambrian): correlation; trilobites, revision, Massachusetts (72).
Huronian: fossil burrows, Ajibik quartzite, Michigan (31).
Illinois: *Fenestella serratula,* Upper Mississippian and Lower Pennsylvanian (26).
index to Foraminifera: new genera, species and varieties, 1949; supplements for 1933, 1936, 1937-1947 (85).
Indiana: Blastoidea, Middle Devonian (16).
Indo-Pacific region. Tertiary, correlation with Australia, Tasmania (18).
International Commission on Zoological Nomenclature: discussion of Proceedings (75); rules on gender (89).
Iowa: Aplington formation (Lower Mississippian), age (77); Brachiopoda, Lower Mississippian (77); conodonts, Devonian (86), Middle Devonian (25), Mississippian (99).

Jagua formation (upper Jurassic); sepioid, Cuba (70).
Japan: Foraminifera, smaller, Tertiary, check list (4); new paleontological journal (59).
Java: corals, n. sp., lower Pleistocene (88).
Journal of Paleontology: 1939 and 1949, reflection of trends of research in (74).
Jurassic: ammonites, classification (3), Foraminifera, South Dakota (50), *Münsterella* (69); upper, correlation (42), origin of Glycymeridae (61), sepioid, Cuba (70).
Kansas: Crinoidea, n. sp., Pennsylvanian (82); fish egg capsule, early Upper Cretaceous (12); *Ptychocladia*, n. sp., n. var., Pennsylvanian (27).
Kawvian series (Pennsylvania): fusulinids, Utah (87).
Kentucky: Blastoidea, Middle Devonian (16); Nautiloidea, n. sp., Mississippian (55).
Lagenidae: Jurassic, South Dakota (50).
La Rosa formation: Venezuela, middle Miocene affinities (10).
Latin, paleontologic: pitfall of (7, 78).
Lockhartia and "*Lockhartia*" (2).
lunule: suggested replacement by term *sigilla* (24).
Massachusetts: trilobites, revision, early Cambrian (72).
Meganos formation (Eocene): division E, Foraminifera, n. sp., California (36).
Meramec (Mississippian): nautiloids, n. sp., Kentucky (55).
Mesolobus (28).
Mesozoic-Cenozoic boundary: Egypt, foraminiferal information on (60).
Metaline limestone (Middle Cambrian): trilobites, correlation, Washington (52).
Michigan: *Fenestella deissi*, Middle Devonian (26); fossil burrows, Huronian (31).
Miocene: *Aturia*, California, Florida, Cuba, Sinai (58), Foraminifera, smaller, Japan, checklist (4), Ostracoda Venezuela (10), *Planularia palmerana*, Texas (35), rodent, new, Texas (40); middle, Ostracoda, checklist, Cuba (9).
Miscellanea nassauensis: generic placement, Tertiary, Florida (2).
Missourian stage (Pennsylvania): Crinoidea, Oklahoma, Kansas (82); fusulinids, Utah (87).
Mississippian: ammonoids, Texas (56), conodonts, Iowa (99); Meramec, Nautiloidea, Kentucky (55); Lower, Brachiopoda, Iowa (77); Upper, *Fenestella serratula*, Illinois (26).
Monocyathus Bedford: versus *Archaeolynthus* Taylor (62).
Montana: Upper Cambrian, faunas, measured sections, Little Rocky Mountains (48); Lower Ordovician, *Bellefontia* fauna, trilobites (49).
morphology: versus phylogeny (98).
names, fossil: conditional, emendation, formation, gender of generic, subspecific (75).
Nautiloidea: classification (32, 37); Mississippian, Kentucky (55); new orders (32); Tertiary, the Americas (57).
Nebraska: *Ptychocladia*, n. sp., n. var., Pennsylvanian (27).
New Jersey: faunule, Esopus formation, Middle Devonian (39).
new names: Bryozoa: *Fenestella foraminosa* Deiss to *F. deissi* Elias (26); *F. tenax* "var." (Ulrich, 1890) as described by Nekhoroshev (1926) to *F. serratula* var. *nekhoroshevi* Elias (26); Cephalopoda: *Kelaeno* Münster, 1842 to *Münsterella* Schevill (69); corals: *Favosites proximus* Davis to *F. proximatus* Stumm (83); Eublastoidea: *Codaster lorae* Dunbar to *Pleuroschisma l., C. pentalobus* Hall to *Pleuroschisma p., C. pulchellus* Miller and Dyer to *Pleuroschisma p.* (67); Foraminifera: *Planularia palmerae* Garrett to *P. palmerana* G. (36); Nautiloidea: Actinoceroidea to Actinoceratida (32); pleosponges: *Polycyathus* Vologdin to *Pluralicyathus* Okulitch (64), *Coelocyathus* Vologdin to *Vacuocyathus* Okulitch (66); Trilobita: *Hebediscus* Whitehouse to *Dipharus* Clark (72).
New Zealand: Tertiary, correlation with Australia and Tasmania (18).
Niagara limestone (Middle Silurian): graptolites, Ontario (13).
nomenclature: International Commission on Zoological, discussion of Proceedings (75); "paleogeography and nomenclature" comments on (71); pleosponge genera (63); principles (3); problems of in paleozoology (42); rules of (28); species (98); stability (98).
North America: Blastoidea, Middle Devonian (16); Catalogue of Devonian fossils, corals (100 and no. 5, p. 635).
Ohio: Ostracoda, n. sp., Middle Devonian (80).
Oklahoma: Crinoidea, n. sp., Pennsylvanian: *Ptychocladia*, n. sp., n. var., Pennsylvanian (27).
Oklan series (Pennsylvanian): fusulinids, Utah (87).
Oligocene: *Aturia*, Oregon and Washington (58), Foraminifera, smaller, Japan, checklist (4), Ostracoda, checklist, Cuba (9), *Pullenia duplicata*, types, Germany (79); upper, *Nimravus altidens*, n. sp., South Dakota (51).
Onondagan: faunule, New Jersey (39).
Ontario: corals, Multisolenida, new order (33); graptolites, Middle Silurian (13).
Oquirrh formation (Pennsylvanian and Permian): fusulinds, correlation, Utah (87).
Ordovician: genotype trilobites, redescription (92); Lower, *Bellefontia* fauna, Montana, geologic history, trilobites, Montana and Wyoming (49).

Oregon: *Aturia*, Oligocene (58); Foraminifera, Pleistocene and Pliocene (5).
ornament: suggestion to replace term with *prosopon*, comments on (96).
orthography: of generic names, illegitimate corrections of (97).
Ostracoda: checklist, Cuba (9); Devonian, Middle, Ohio (80); Eocene, Alabama; Miocene, Venezuela (10); Paleozoic (47).
Paläontologische Zeitschrift: attempt to resume publication (44).
paleobotanical transfer method (1).
Paleocene: Nautiloidea, California, Baja California, Colombia, Trinidad (58).
paleoecology: place and value (28).
"Paleogeography and nomenclature": comments on (71).
paleontology: application of genetic terms to (28); fundamentals (101); quantitative (28, 29, 42, 76); research, trends in (74); evaluation of present state (28); synthesis of biology and geology (28).
Paleozoic: ammonoids, role in geology (54); stratigraphically useful invertebrates (28); Ostracoda (47); Foraminifera, Nebraska, Kansas, Oklahoma, Texas, Russia (27).
Pelecypoda: Glycymeridae, origin (61); substitutes for terms *lunule* and *escutcheon* (24).
Pennsylvania: Crinoidea, Oklahoma, Kansas (82), Foraminifera, Nebraska, Kansas, Oklahoma (27), fusulinids, Utah (87); Lower, *Fenestella serratula*, Illinois (26); Upper, ammonoids, Texas (57).
Permian: algal-foraminiferal consortium, Texas (43), platysomid, Texas (95); Lower, Foraminifera, n. sp., Texas (27, 43), Russia (27).
Peru: Eocene nautiloids, *Aturia, Deltoidonautilus, Hercoglossa* (58).
phylogeny: versus morphology (98); phylogenetic method (42); Eublastoidea, relations (67).
physical change: relationship to biological change (76).
Pilgrim formation (Upper Cambrian): faunas and measured sections, Montana (48).
plant spores: Carboniferous, Utah, and comparison to British, Polish, Russian (68).
Planularia; P. palmerana, Miocene, Texas (35); *P. planotrochiformis*, Cretaceous, Texas (41).
platysomid: Permian, Texas (95).
Pleistocene: Foraminifera and lithology, Oregon (5); lower, corals, n. sp., Java (88).
pleosponges: *Archaeolynthus* versus *Monocyathus* (62); Upper Cretaceous, Texas (93); nomenclatural notes (63); *Pluralicyathus* Okulitch (64).
Pleuroschisma: Silurian, potential ancestor for several later eublastoids (67).
Pliocene: Foraminifera, Oregon (5); Japan, check list (4); lithology, fossils, Oregon (5).
Poland: plant spores, Carboniferous, comparison with Utah (68).
Precambrian: fossil burrows, Huronian, Michigan (31).
prosopon: for *ornament*, comments on (96).
Ptychocladia: Pennsylvanian, Nebraska, Kansas, Oklahoma (27).
publication: date and definition of (75).
Pullenia duplicata: formal description and designation of type specimens (74).
Putjangan beds (lower Pleistocene); corals, n. sp., Java (88).
quantitative paleontology: evolution, rates of (76); human errors in (28); determining physical characters of fossil environments (29); statistical studies, comments on (42).
range chart: in foraminiferal correlation, arrangements, types (14).
reptiles: Cope's types, synonymies and catalogue numbers, University of Texas (94).
research, trends in: reflected in Journal of Paleontology, 1939 and 1949 (74).
reviews: Contributions to the knowledge of the young Caenozoic Ostracoda from the Malayan region, by J. Th. Kingma (21); Die Lebensweise der Dinosaurier, by Martin Wilmarth (17); Ist eine unveränderliche Form des Art-Namens möglich? (Is an unchanging form of species names possible?), by Rudolf Richter (89); Foraminifères d'Aquitaine (Première partie: Reophacidae à Nonionidae), by J. Cuvillier and V. Szakall (22); Meaning of evolution, a study of the history of life and of its significance for men, The, by George Gaylord Simpson (90); Paléontologie marocaine I. Généralités sur les invertebrés fossiles, by Geneviève Termier and Henri Termier (84); Ricerche stratigrafiche e micropaleontologiche sul Cretacia e sull-Eocene di Tignale (Lago di Garda), by Maria Bianca Cita (30); Smaller Foraminifera from Bodjonegoro (Java), by L. Boomgaart (23); Structure of the body of the regular Archaeocyathi, The (On the basis of a study of *Archaeocyathus demboi*, sp. nov), by A. G. Vologdin (65).
rodent: new, Miocene or Oligocene, Texas (40).
Russia: *Chabakovia* Vologdin, Middle or Lower Cambrian, southern Urals (27); *C.* (?) *shulgae*, Lower Permian (27); *Fenestella serratula* var. *nekhoroshevi*, Lower Carboniferous (26); plant spores, Carboniferous, comparison with Utah (68); *Vacuocyathus*, Middle Cambrian (66).
Scotland: Ordovician, *Robergia, Phillipsinella parabola* (92).
sections, serial: grinding instrument for (20).
"separatist tendency" (42).
Sepioidea: upper Jurassic, Cuba (70).
"Short Papers": new Japanese paleontological journal (59).

Shumardites-Properrinites-Perrinites (28).
sigilla: proposed term to replace *lunule* (24).
Silurian: eurypterid, new, West Virginia (46); Lower, *Törnquistia* (92); Middle, Eublastoidea (67), graptolites, Ontario (13); Upper, eurypterid, new, Florida (45).
Sinai: *Aturia,* Miocene (58).
slide rule, fusulinid (91).
Society records and activities: Paleontological Society (no. 1, pp. 119, 120; no. 3, p. 396; no. 5, pp. 626, 636); Society of Economic Paleontologists and Mineralogists (no. 2, p. 248; no. 4, p. 517).
South Dakota: Foraminifera, Jurrassic (50); *Nimravus altidens,* n. sp., upper Oligocene (51).
speciation, rates of (76).
species: biological (98); in evolutionary transition, genus designation (38); longevity of (76); paleontological (98); type, designation of (75).
Spiriferidae: n. gen., n. sp., Devonian, Alberta (19).
sponges: *Archaeolynthus* versus *Monocyathus* (62); pleosponges, nomenclatural notes (63); Upper Cambrian, Texas (93); *Vacuocyathus,* Russia (66).
spores, plant: Carboniferous, Utah, and comparison to British, Polish, Russian (68).
statistical studies, *see* quantitative paleontology.
Stephen formation (Middle Cambrian): correlation with Metaline limestone, Washington (52).
stratigraphy: Aplington formation, Lower Mississippian, Iowa (77); factor in paleontologic taxonomy (6); horizons of faunal change, relative significance of (14).
Sundance formation (Jurassic): Foraminifera, South Dakota (50).
superposition, law of: discussion (6).
Sweetland Creek beds (Devonian): conodonts, lower shale, Iowa (86).
synonymous homonyms: examples (34).
Tasmania: Tertiary marine rocks, sedimentary provinces, Foraminifera, correlation (18).
taxonomy: problems (42); ammonites (3); stratigraphy in (6).
thin sections: recommendation of greater thinness (28).
Tournaisian, lower: *Fenestella serratula* var. *nekhoroshevi,* Russia (26).
Tertiary: Foraminifera, Florida (2), smaller, Japan, check list (4); Guaduas formation, Colombia, age correction (15); marine, Australia (18); Nautiloidea, the Americas (57).
Texas: algal-foraminiferal consortium, Permian (43); ammonoids, Mississippian (56), Upper Pennsylvanian (57); *Aturia,* Eocene (58); *Bdelloidina (?) permica,* n. sp., Lower Permian (27); *Planularia palmerana,* new name for *P. palmerae,* Miocene (35), *P. planotrochiformis,* n. sp., Cretaceous (41); platysomid, Permian (95); pleospongid-type organism, n. gen., n. sp., Upper Cambrian (93); rodent, new, Miocene or Oligocene (40); University of, fossil reptiles, Cope's types, in collection of (94).
transfer method, paleobotanical (1).
Trilobita: Cambrian, early, Massachusetts, revision (72); Cambrian, Middle, Washington (52); Cambrian, Upper, Montana (48); Ordovician, redescriptions of genotypes and assignment to new orders (92); Ordovician, Lower, *Bellefontia* fauna, Montana, Wyoming (49); *Trinucleus* Murchison, 1839, as nomen conservandum; type species (73).
Trinidad: *Cimomia,* Paleocene (58); *Hantkenina,* Eocene (11).
Trinucleus Murchison, 1839: as nomen conservandum, discussion of type species (73).
Triticites: n. sp., Pennsylvanian, Utah (87); *-Schwagerina* (28).
type species and genera: designation of (75).
uniformity, Lyellian (42).
Utah: plant spores, Carboniferous (68); fusulinids, correlation, Pennsylvanian (57).
Utharocrinus: n. sp., Pennsylvanian, Oklahoma, Kansas (82).
vallis: proposed term to replace *escutcheon* (24).
varietal names: designation (78); gender (7, 78).
Venezuela: Ostracoda, Miocene (10).
Virgilian stage (Pennsylvanian): Crinoidea, Oklahoma, Kansas (82); fusulinids, Utah (87).
Wasatch Mountains: fusulinids and correlation, Pennsylvanian, Utah (87).
Washington: Nautiloidea, Eocene, Oligocene (58); Trilobita, Middle Cambrian (52).
West Virginia: eurypterid, new, Silurian (46).
Wills Creek formation (Silurian): eurypterid, new, West Virginia (46).
Wyoming: *Bellefontia* fauna, trilobites, Lower Ordovician (49).
zoologists, list of: publication planned (no. 5, p. 635).

The McLean CARD CATALOGUE OF AMERICAN FORAMINIFERA



Species Index Cards of the American Foraminifera

Now Available

Unit 1. Diagnostic smaller Foraminifera of the Later Tertiary. . . . 50 cards.

Unit 2. Additional diagnostic smaller Foraminifera of the Later Tertiary and the diagnostic larger Foraminifera of the Heterostegina zone. . . . . .50 cards.

Units 1 and 2 cover Foraminiferal zones of the Gulf Coast Later Tertiary. Other units being assembled.

Price per unit of fifty cards $5.00

JAMES D. McLEAN, JR.

P.O. Box 916 Alexandria, Virginia

JOINT ANNUAL MEETING

JEFFERSON HOTEL, ST. LOUIS

APRIL 23–26, 1951

The annual meeting of the S. E. P. M. will be held at the Jefferson Hotel, St. Louis, Mo., on April 23, 24, 25, and 26, 1951. As in previous years the meeting will be held jointly with the A.A.P.G. and S.E.G.

S.E.P.M. Technical Program

In addition to presidential addresses and joint sessions with the other two exploratory societies, the S.E.P.M. program will include technical sessions and a symposium. The S.E.P.M. symposium will be on "The paleoecology of shale and evaporite deposition," and will include papers by outstanding investigators.

President Krumbein has appointed W. D. Keller, University of Missouri, Columbia, Missouri, to be program chairman for the S.E.P.M. Members planning to submit papers should notify the program chairman by January 1st of the title and length of their papers. Abstracts, typewritten, double-spaced, and in duplicate, are due on or before February 1st.

OFFICERS OF THE SOCIETIES

THE SOCIETY OF ECONOMIC PALEONTOLOGISTS AND MINERALOGISTS

For the year ending April 1951

President, WILLIAM C. KRUMBEIN, Evanston, Ill.

First Past-President, H. B. STENZEL, Austin, Tex.

Second Past-President, R. DANA RUSSELL, San Diego, Calif.

Vice-President, GORDON RITTENHOUSE, Cincinnati, Ohio

Secretary-Treasurer, CECIL G. LALICKER, Lawrence, Kan.

Editors

J. MARVIN WELLER, Chicago, Ill., for paleontology.

W. H. TWENHOFEL, Orlando, Fla., for mineralogy.

JACK L. HOUGH, Urbana, Ill. (managing editor) for mineralogy

THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

For the year ending April 1951

President, C. L. MOODY, Shreveport, La.

Past-President, C. W. TOMLINSON, Ardmore, Okla.

Vice-President, JOHN EMERY ADAMS, Midland, Tex.

Secretary-Treasurer, HENRY N. TOLER, Jackson, Miss.

Editor, ALFRED H. BELL, Urbana, Ill.

THE PALEONTOLOGICAL SOCIETY

For the year ending November 1950

President, CHARLES E. WEAVER, Seattle, Wash.

Vice-President, W. STORRS COLE, Ithaca, N. Y.

Secretary, KENNETH E. CASTER, Cincinnati, O.

Treasurer, FRANK M. SWARTZ, State College, Pa.

Editor, A. SCOTT WARTHIN, Poughkeepsie, N. Y.

Chairman, Pacific Coast Section, V. J. OKULITCH, Vancouver, B. C.

Ex-Presidents

R. C. MOORE, Lawrence, Kans. 1947.
W. P. WOODRING, Washington, D. C., 1948.
WINIFRED GOLDRING, Albany, N. Y., 1949.

JOINT COMMITTEE ON ZOOLOGICAL NOMENCLATURE FOR PALEONTOLOGY IN AMERICA

Sponsored by the Society of Economic Paleontologists and Mineralogists, The Paleontological Society, and the Society of Vertebrate Paleontology in support of the International Commission on Zoological Nomenclature.

Policy Board

G. WINSTON SINCLAIR, *Chairman* (PS);
R. C. MOORE (PS); A. S. ROMER (SVP)

Members

DAVID H. DUNKLE S. W. MULLER J. M. WELLER J. B. REESIDE, JR.	1949–1951
D. L. FRIZZELL A. MYRA KEEN KATHERINE V. W. PALMER ALFRED S. ROMER	1950–1952
RAYMOND C. MOORE J. BROOKES KNIGHT G. WINSTON SINCLAIR JOHN W. WELLS	1951–1953

Address all communications to the chairman, G. WINSTON SINCLAIR, University of Michigan, Ann Arbor, Mich.

THE GEOLOGICAL SOCIETY OF AMERICA

For the year ending November 1950

President, WILLIAM W. RUBEY, U. S. Geological Survey, Washington 25, D. C.

Past-President, CHESTER R. LONGWELL

Vice-Presidents: CHESTER STOCK; ROBERT B. SOSMAN; WINIFRED GOLDRING; JOHN W. GRUNER

Secretary, H. R. ALDRICH, New York, N. Y.

Treasurer, J. EDWARD HOFFMEISTER, Rochester, N. Y.

Councillors

GEORGE M. FOWLER F. J. PETTIJOHN EARL INGERSON	1948–1950
JOHN W. AMBROSE S. W. MULLER THOMAS B. NOLAN	1949–1951
E. F. DAVIS J. HOOVER MACKIN RICHARD J. RUSSELL	1950–1952